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Air Pollution Emissions Inventory Systems Appendix C. Emissions Inventory in the Federal Republic of Germany

NATO Committee on the Challenges of Modern Society, Brussels (Belgium)

Aug 80

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COMMITTEE ON
THE CHALLENGES OF
MODERN SOCIETY

AIR POLLUTION EMISSIONS INVENTORY SYSTEMS
APPENDIX C
EMISSIONS INVENTORY IN THE FEDERAL REPUBLIC OF GERMANY

Number 104

NORTH ATLANTIC TREATY ORGANIZATION

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16. ABSTRACT

This document is an appendix to report Number 104; it gives a general overview of emissions inventory systems and methods used in the Federal Republic of Germany.

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AIR POLLUTION EMISSIONS
INVENTORY SYSTEMS

A Report of the NATO/CCMS Pilot Study
on Air Pollution Assessment Methodology and Modeling

No. 104, APPENDIX C

Air Pollution Emissions Inventory Systems
used in The Federal Republic of Germany

COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY
NORTH ATLANTIC TREATY ORGANIZATION
(August 1980)

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Preface

The North Atlantic Treaty Organization (NATO) established the "Committee on the Challenges of Modern Society" (CCMS) at the November 1969 meeting of the North Atlantic Council.

The CCMS was charged with developing meaningful environmental and social programs that complement other international programs, and with showing leadership, first, in solution of existing problems and, second, in development of long-range goals for environmental protection in the NATO sphere of influence and in other countries as well. A first Pilot Study on Air Pollution was initiated by the CCMS at its inaugural meeting in December 1969. The United States (Environmental Protection Agency) has been the pilot nation with the Federal Republic of Germany (Federal Ministry of the Interior) and Turkey (Scientific and Technical Research Council) as copilot-nations.

The Pilot Study on Air Pollution was an action program designed to demonstrate and encourage the utilization of existing knowledge for the development of air quality management programs. It entailed the demonstration of a system approach to air quality management. Case studies have been carried out in Ankara, Turkey; Frankfurt, Federal Republic of Germany; St. Louis, U. S.; Oslo, Norway; South Holland Region, The Netherlands (NATO/CCMS Report No. 6, Appendices A - E).

The results of the pilot study are documented in NATO/CCMS Report No. 6 (Revised) "Guidelines to Assessment of Air Quality" of October 1972 and in NATO/CCMS Report No. 33 (Final Report) containing 15 recommendations as well as in several other documents, listed as Annex II to this document.

Starting from three of the above recommendations (VI, VII and XIV) the Federal Republic of Germany proposed to initiate a new Pilot Study on Air Pollution Assessment Methodology and Modeling at the CCMS Plenary Session on October 22 and 23, 1974.

These NATO/CCMS Recommendations are:

RECOMMENDATION VI

Member nations will co-operate to develop standardized methods for emissions data storage and retrieval to support requirements in the conduct of national air quality management programs. The US National Emission Data System (NEDS) might serve as a model for a common international system.

RECOMMENDATION VII

Member nations will co-operate to develop standardized techniques for projecting emissions and predicting future ambient air quality.

RECOMMENDATION XIV

Member nations agree the CCMS modeling activity has shown that there is a widespread need for further international co-operation to accomplish the following tasks:

> Bring together model developers and air quality managers for exchange of ideas, discussion of users' needs and demonstration of modeling techniques.
>
> Standardize modeling techniques for specific air quality management applications and consider how computerized models might be made available for all users.
>
> Continue to review on-going air quality assessment studies.

In spring 1975 the North Atlantic Council approved the German proposal. The pilot study work started with the Federal Republic of Germany (Federal Ministry of the Interior) as pilot nation and the United States of America (Environmental Protection Agency) and Belgium (Service du Premier Ministre) as co-pilot nations:
A Working Group and two Panels were established with the following functions:

Assessment Methodology Panel

- Pursue and carry out Recommendations VI and VII
- Continue to review present and future assessment studies with respect to the application of assessment methodology.

Modeling Panel

- Develop standardized models for various air quality management applications.
- Develop programs to improve modeler/user communications in conjunction with the Assessment Methodology Panel and the Working Group.
- Continue as an information forum on new modeling concepts and techniques, organizing once a year international technical meetings on air pollution modeling and its application.

In addition the Working Group established an Ad-Hoc Group on Air Quality Management Systems to revise and update the NATO/CCMS Report No. 6 (Revised) 1972 by preparing a new document on "Guidelines to Air Quality Management Systems".

Another Ad-Hoc Group was set up for compiling a Glossary of Terms frequently used in assessment methodology, modeling and air quality management systems.

As an outcome of this Pilot Study on Air Pollution Assessment Methodology and Modeling the following NATO/CCMS documents are published (see also Annex III):

Air Quality Management System

- Guidelines to Air Quality Management System.

Assessment Methodology

- Air Pollution Emissions Inventory Systems
- Air Pollution Emissions Projecting

Air Pollution Modeling

- Introduction to Air Quality Modeling
- Uses and Needs for Air Quality Modeling
- Bibliography on Grey Literature on Air Quality Modeling, Part I (Applied Models)
- Bibliography on Grey Literature on Air Quality Modeling, Part II (New Modeling Techniques)
- Practical Demonstration of Multiple Source Urban Air Quality Modeling (Gaussian Plume)
- Fundamentals for the Applications of a Gaussian Plume Model

Other Publications

- Glossary of Terms
- Proceedings of the 6th to 9th International Technical Meetings on Air Pollution Modeling and its Application
  (6th Meeting, 24. - 26. Sept. 1975, Frankfurt/Main, Germany)
  (7th Meeting, 7. - 10. Sept. 1976, Airlie House, USA)
  (8th Meeting, 20. - 23. Sept. 1977, Louvain-la-Neuve, Belgium)
  (9th Meeting, 29. - 31. Aug. 1978, Toronto, Canada).

The chairman of the Working Group wishes to acknowledge the scientists participating from pilot, copilot, and observer countries, and the many other persons, who assisted in the preparation of this document.

The panel, which performed diligently throughout the course of this effort, receives the highest praise. The panel members were:

Federal Republic of Germany - Pilot Country

[illegible]. Gerold
H. Meinl
K. E. Joerss

Belgium - Copilot Country

R. Dams
C. de Wispelaere

United States of America - Copilot Country

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P. J. Choquette

France - Observer

W. Challemel du Rozier

Norway - Observer

O. I. Skogvold

The Netherlands - Oberserver

L. H. J. Wachters.

The addresses of the panel members are listed in Annex I.

Full recognition is given to each panel member for carrying out and coordinating review and other activities related to the development of this document in his respective country and to Ms. C. Morawa of the Federal Environmental Office, Germany for her effort in coordinating and organising and for editorial work.

For the Working Group,
Erich Weber, Chairman.

The present document is an appendix to the NATO/CCMS document

AIR POLLUTION EMISSIONS INVENTORY SYSTEMS

No. 104, October 1978

which gives a general overview of the matter of emissions inventory systems as well as of the methods currently applied in BELGIUM, CANADA, the FEDERAL REPUBLIC OF GERMANY, The NETHERLANDS, NORWAY and the UNITED STATES OF AMERICA.

It contains documentations of air pollution emissions inventory systems currently used in

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Germany, F. R.	Appendix C
The Netherland	Appendix D
Norway	Appendix E
United States	Appendix F

Each appendix is bound as a separate volume

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Annex I Names and Addresses of Panel Members

Annex II NATO/CCMS Documents on the First NATO/CCMS Air Pollution Pilot Study

Annex III NATO/CCMS Documents on the Pilot Study on Air Pollution Assessment Methodology and Modeling

1. Legal Provisions

1.1 Federal Immission Protection Act

The Federal Immission Protection Act*) of March 15, 1974 gave the immission protection legislation of the Federal Republic of Germany a fundamental new order. This act aims at protecting man, animals, plants and materials from harmful environmental effects caused by air pollution, noise, vibration, light, heat, non-ionizing radiation and similar phenomena (immissions) and at preventing harmful environmental effects. An essential innovation of this act - the prescriptions replaced partially trace back to the 19th century - lies in the concept that immission protection may no longer be understood as a mere reaction upon harmful environmental effects but as a measure of precaution brought into action as a planning tool.

For the enforcement of its aims the Fed. Imm. Prot. Act makes available manifold instruments starting from the traditional licensing procedure for specified plants via quality standards for substances and products up to novel instruments such as emissions inventories and clean air plans for Heavily Polluted Areas.

Regions in which particularly high air pollution exists or are to be expected need special measures exceeding the general administrative control which is the same for all parts of the Federal Republic of Germany. Such regions by ordinance of the Land Government can be declared as Heavily Polluted Area. One of the liabilities arising from this is the establishment of an emissions inventory and insofar harmful environmental effects actually occur or are to be expected is the establishment of a clean air plan. Amongst assessing the present and presumable future air pollution the emissions inventory and the clean air plan especially aim at the development of a medium-term measure program to reduce air pollution and to take precautions.

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*) Law for the Prevention of Harmful Effects in the Environment caused by Air Pollution, Noise, Vibration and Similar Phenomena.

The principles for establishing and running emissions inventories are laid down by the fifth General Administrative Regulation of January 30, 1979 under the Fed. Imm. Prot. Act.

The supply of the data needed for the establishment of an emissions inventory is different for the emitter categories industry, domestic heating and transportation. The Fed. Imm. Prot. Act obliges the operators of industrial installations subject to licensing to provide annually information about the kind, the amount, the spatial and temporal distribution of air pollution released by the installation and about the outlet conditions (emissions declaration). The details are regulated by the 11th Ordinance under the Fed. Imm. Prot. Act. This emissions declaration has to be delivered firstly for the year 1979 in 1980. For the remaining emitter categories domestic heating and transportation the authorities are obliged to establish and to regularly update an emissions inventory on the basis of own observations and investigations.

1.2 Heavily Polluted Areas

In Fig. 1 the term "Heavily Polluted Area" be illustrated by the example of the most densely industria-

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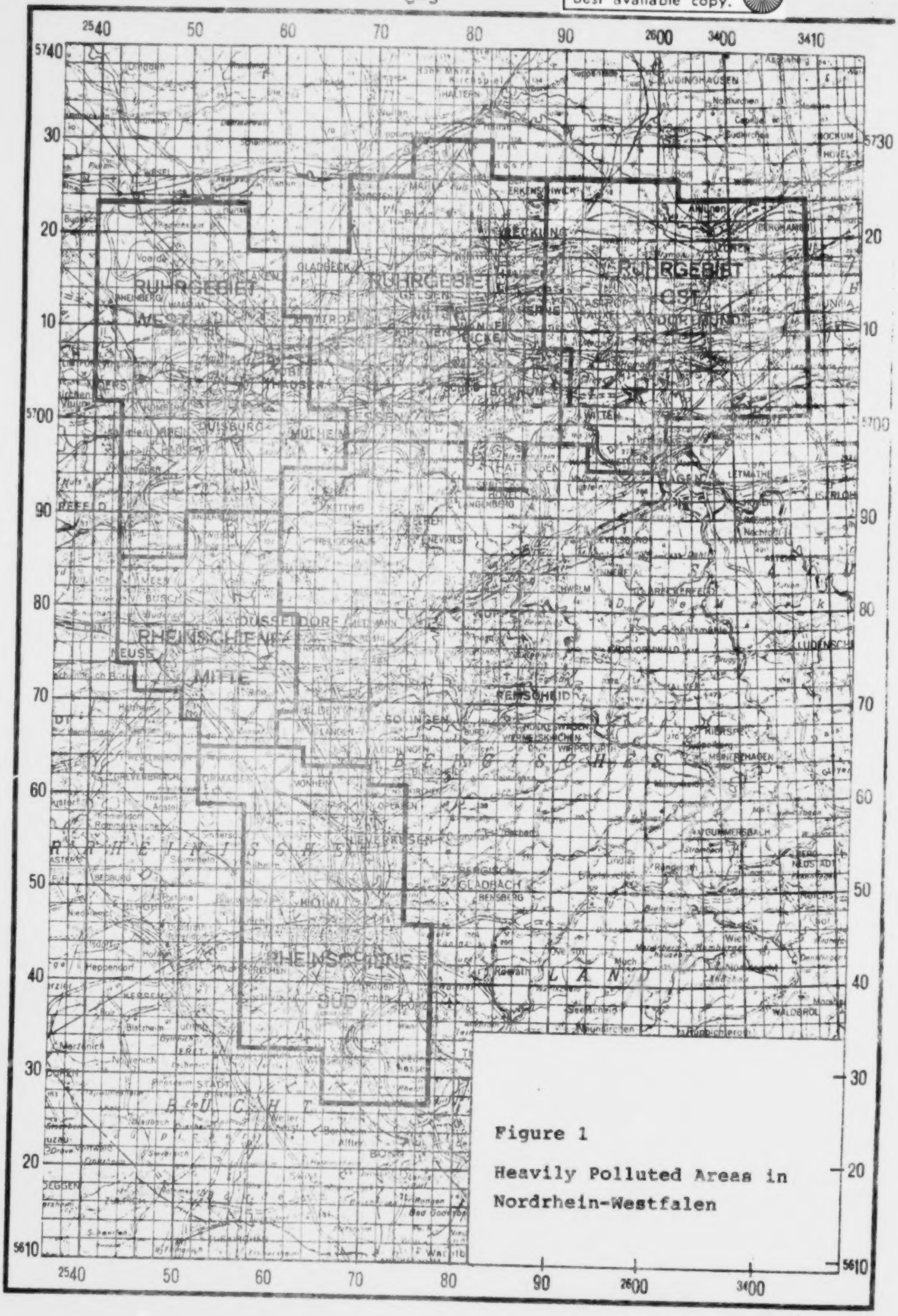

Figure 1

Heavily Polluted Areas in Nordrhein-Westfalen lized regions of the Land Nordrhein-Westfalen. Five Heavily Polluted Areas have been determined:

- Rheinschiene Süd (Raum Köln)
  Rhine Area South (Cologne Region)
- Rheinschiene Mitte (Raum Düsseldorf)
  Rhine Area Middle (Duesseldorf Region)
- Ruhrgebiet West (Raum Duisburg - Oberhausen - Mülheim)
  Ruhr Area West (Duisburg - Oberhausen - Muelheim Region)
- Ruhrgebiet Mitte (Raum Essen)
  Ruhr Area Middle (Essen Region)
- Ruhrgebiet Ost (Raum Dortmund)
  Ruhr Area East (Dortmund Region)

For the Heavily Polluted Areas Rheinschiene Süd, Ruhrgebiet West and Ruhrgebiet Ost clean air plans have already been published. The emissions inventories and clean air plans for the remaining regions are being set up.

In other German Laender, too, emissions inventories have been set up and reports have been published, e. g. in Rheinland-Pfalz for the Ludwigshafen region and in Hessen for the Wiesbaden region.

The legally prescribed emissions declarations will not be available before 1980. The hitherto existing emissions investigations at installations subject to licencing had to be performed either by experts commissioned by the authorities or on the basis of voluntary emissions declarations by the plants operators.

2. Systematics

2.1 Concept and Characteristics

When the German Land Nordrhein-Westfalen gave a development contract to the Technical Inspection Agency Rhineland (TÜV Rheinland) in 1968 a process was initiated which led to the establishment of an emissions inventory for the Cologne region whose high resolution was unknown so far. The second step was the introduction of the emissions inventory as a legally prescribed planning tool in 1974. The necessity to perform well-adjusted clean up measures in Heavily Polluted Areas was the reason for the development aiming at the complete documentation of the emissions situation. Because of the large number of data to be expected the whole system had to be designed as a computerized system. The data processing system should include also information on the causes of the emissions. It therefore should be designed for the individual analysis of each larger plant.

The systematics of the emissions inventory including the aforementioned criteria is consistent with the aims and criteria of the German General Administrative Regulation "Emissions Inventories in Heavily Polluted Areas" /3/. This systematics has been adapted by those German Laender which have declared certain regions as Heavily Polluted Areas. Other German Laender intend to establish emissions inventories without having declared Heavily Polluted Areas corresponding to the Fed. Imm. Prot. Act and have more or less diverging ideas.

Further to the application for Clean Air Plans the German Laender Nordrhein-Westfalen and Rheinland-Pfalz make use of the emissions inventories as an aid within the licensing procedures. Emissions forecasts - necessary during the licensing procedures - have to be prepared according to this systematics and documented on given forms. These forecasts are checked for completeness and plausibility against the data of comparable plants. The emission and plant data of the planned facilities are fed into the emissions inventory of the corresponding region.

The emissions inventory to be described here is characterized by the following:

- universality: the systematics is uniform for all emitter categories and thus all plants and applicable to all air pollutants,

- flexibility: the systematics allows every desired resolution with respect to time and space, i. e. it allows on the one hand the time-dependent description of the separate emission events up to the accidental event within an aggregate or on the other hand the information about the average total emission of the plant. That means it does not stick to fixed time or space patterns,

- cause orientation: the systematics differentiates between the processes - within the plant or aggregate - being responsible for the emissions (causes) and the places of their transition into the atmosphere - the sources,

- emissions orientation: the systematics allows a largely qualitative description of the causes for emissions. Except giving the nominal capacity no figures of masses of raw materials, fuels or products are mentioned. Emissions therefore are exclusively described by absolute mass flows and not as specific values such as emission factors.

The systematic separation of causes and sources of the emissions allows to display different situations as given in Figure 2:

- one plant is emitting via one source only,
- one plant is emitting via several sources,
- several plants are emitting via one joint source.

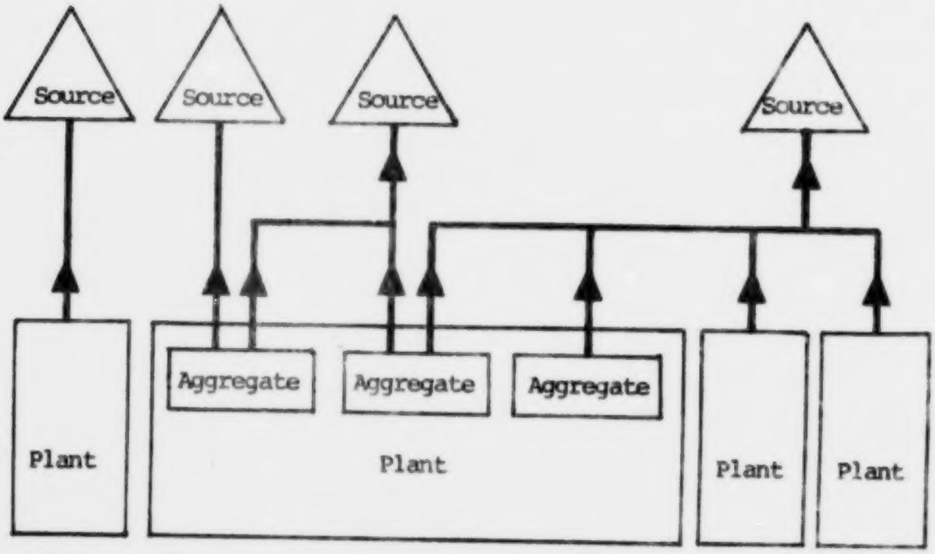

Figure 2: Plant source configurations

2.2 Structure

The data of the emissions inventory are arranged in groups of information (data sets) which are stored in different data files:

- substance data file
- operator data file
- source data file
- plant data file
- emission data file

The data sets themselves consist of real figures, code numbers (code Nos.) and texts if applicable. Complete lists of code Nos. for the kinds of plants and the source types and some code Nos. for plant types are given in addendum I.

The data sets of the data files are cross correlated via identification numbers (key Nos.) as outlined in Table 1.

The emission data file can be seen as the core of the whole system. This data file is assisted directly by the mode text data file that allows to store verbal explanations.

The other data files serve to decode information given in the emission data file as key Nos. Such explanations need not be part of the data bank itself. E. g., the code Nos. to describe the plants may be available within a handbook.

Table 1: Relation between data files

Data file	Identification of the data set							Contents of the data set
	operator no. (5 digits)	site no. (3 digits)	plant no. (3 digits)	aggregate no. (3 digits)	source no. (3 digits)	substance no. (4 digits)	mode no. (4 digits)	
substance						x		substances emitted and handled (fuels, products etc.)
operator	x	x						addresses of the persons responsible for the plant
source	x	x			x			description by type, location and dimensions
plant	x	x	x	x			x	description by kind, type, location and substances handled
emissions	x	x	x	x	x	x	x	description of the flow of emissions and flue gases including time dependences
mode text	x	x	x	x	x		x	verbal description of processes causing the emissions

2.3 Elements of the Emission Event

The basic principle consists in the structuring of the emission behaviour of the plant into single emission events, correlated to special causes having individual time dependences. This approach reflects the procedure of determining emissions via calculations which must begin with the analysis of the technical (or natural) process that causes emissions. Each data set in the emissions data file or each line in the coding form EMISSIONS represents such an emission event. Dependences between different emission events cannot be described. In detail, each emission event is characterized by the following elements:

- operator as responsible person
- site, necessary if an operator has plants at different locations
- operational set-up - termed plant-aggregate - as the place of the emissions causing process; Such set-ups may - by aid of the first part of the identification number - be designated as plants or - adding the second part - be designated as aggregates within the frame of a plant. Aggregates are parts of plants or represent sections of processes having an individual emission dependence
- source, being the place of transition of emissions into the atmosphere
- intensity of the operational process given in the percentage of the nominal capacity

- substance, as a qualitative description of the emission. If more than one substance is emitted different emission events with identical cause and time dependence have to be described
- mass flow of the emitted substance as a quantitative information
- volume flow and temperature of flue gas at the source, if applicable
- modes. The emissions mode describes the operational process in the mode text data file while the operation mode coordinates the substances handled in one operation (within the plant data file)
- time dependence, the emission event occurs continuously or discontinuously within a definite time span. For discontinuous processes the frequency and the duration of the individual emission operations are indicated.
- control device if applicable.

The possible contents of the emissions inventory can be derived from the following coding forms

- SUBSTANCE DATA
- SUBSTANCE GROUP DATA
- OPERATOR DATA
- SOURCE DATA
- PLANT DATA
- EMISSION DATA
- MODE TEXT

The substance group data file is designed for often occuring mixtures of substances. The individual components are registered in the substance data file Whenever the exact composition is unknown the elementary analysis can be given.

These coding forms are given and explained in addendum II pages 1 through 7. They already give an insight into the structure of the data files.

Some of the data concerning the emissions are processed in view of future evaluations while fed into the data file, already: e. g. the concentration in mg/m^3 and the annual emission in kg/a are calculated and stored.

It shall be mentioned, however, that - in accordance with the emissions data file as the listing of the emissions events - comprehensive information on the emissions cannot be stored. Such data e. g. the annual emissions of a plant or an emitter category are determined using evaluation programs.

3. Methods of Data Collection

The data files mentioned in the preceding chapter form a complete system to store the data related to emissions. These data must be determined for each plant by analysing the emission events. Depending on the necessary resolution this analysis must be performed for each plant - individual approach - or for representative plants - collective approach. The individual approach is applied mainly for the industrial plants while the emitter categories domestic heating, minor industry and traffic are treated via the collective approach.

3.1 Individual Approach

If investigations of plants are performed by experts the coding forms given in addendum II pages 1 - 7 can be used directly.

If data shall be supplied by the operator questionnaires are necessary. Their completion must be possible without a special knowledge of the systematics of the emissions inventory. Questionnaires may be either uniformly available for all kinds of plants - e. g. the forms given in the German ordinance on emissions declarations /2/ (see addendum III) - or developed especially for certain kinds of plants. The data introduced in the questionnaires then must be transferred by experts into the corresponding coding forms.

An example of an investigation via the individual approach including the analysis of the emission events is given in the addendum IV for a power plant.

3.2 Collective Approach

This approach is characterized by a two stage procedure:

- first, the average emission dependence of the emitting plants is investigated by analysing some representative plants (plant standards) or it is taken from the literature and can in the simplest case be described by emission factors

- second and this stage is the investigation in a narrow sense, those data are collected which are necessary to describe the regional distribution and the source conditions and to calculate the emissions of the plants. Typical for this kind of investigation is the use of general available, often statistical, data or a few basic data, which can be gained economically.

The methods of the collective approach are outlined in the following paragraphs. Corresponding examples are given in addendum V.

3.2.1 Domestic Heating and Minor Industry

The concept of "plant standards" (1. stage of the collective approach) was developed especially for this emitter category. A plant standard describes representatively the complete emission dependence of a plant of a certain type and capacity in accordance with the resolution desired. The relevant air pollutants are included and the time dependence corresponds to the average uses.

The plant standard for domestic heating plants is developed mainly from calorimetric calculations, climatologic data corresponding to a long term average (e. g. degree days) and statistical investigations with respect to the uses and needs of space heatings. Thus, the plant standard and consequently the emissions inventory does not reflect the actual situation on the year of investigation, exactly.

In the category of minor industry selected plants are analysed individually and checked with respect to representation.

Therefore, the plant standard is an ambitious set of emission factors being related to a certain plant capacity. The emissions of any plant or of a group of plants are then calculated proportional to the capacities. A list of plant standards available is given in addendum V.

The collection of the data of emitting plants (2. stage of the collective approach) is done in some German Laender using the coding forms FIREPLACES IN SPACE HEATING AND MINOR INDUSTRY and MINOR INDUSTRY (see addendum II).

The data for the domestic heating installations are investigated by the chimney sweepers with the help of the first mentioned coding form. Each house is treated separately, thus allowing an easy updating. Larger heating installations especially central heating systems are characterized by the type of building, nominal capacity and energy carrier. Smaller units for heating and boiling purposes or else are only described by the number of chimneys. An example of this method of investigation is outlined in addendum V.

For reasons of completeness and plausibility those buildings can be inserted, too, which are supplied by district or electrical heating.

The basic data for the minor industry (fireplaces excluded) are investigated using questionnaires as given in addendum III, 2, at first. Then the information is transformed by experts into the coding form MINOR INDUSTRY (addendum II). Each plant is described by its coordinates, source conditions and capacity data. The latter data are e. g. input or throughput of certain materials handled (quantity of clothes in dry cleaning facilities or petrol sold in filling stations).

In principle it is possible to feed the data of plants of this category via the individual approach into the data files, too.

3.2.2 Transportation

In the Heavily Polluted Areas - declared as such in the Federal Republic of Germany - the street traffic was of importance only within the emitter category transportation. In this category a high space and time resolution is requested, too. The main streets or sections of them are treated as line sources and areas with lower traffic density as area sources. This leads to sources of strongly differing traffic situations and dependences, e. g. expressways and city streets. If the time dependence of the emissions which is strongly correlated to the driving characteristics shall be correctly assessed a very detailed method is likewise necessary on the part of the emission behaviour.

In the sense of the first stage of the collective approach emission factors are determined for different kinds of motor vehicles.

The emission factors are evaluated from measurements on a testing facility for several driving cycles (e. g. traffic on expressways or during rush hours) represented by driving modes. Each driving mode covers a range of driving speeds and is characterized by an average speed. The measurements are performed with a sample of vehicles being representative for the vehicle fleet in the Federal Republic of Germany at a certain time.

The data collection itself (2. stage of the collective approach) is done using the coding form STREET TRAFFIC (addendum II). The traffic load is determined on the line sources and representative streets of the area sources. Furthermore the average driving speed is measured by a car running together with the normal traffic. The traffic shows a typical dependence of day time and day of the week. For sake of simplification three day time dependences are taken into account only - working day (Monday to Friday), Saturday and Sunday. A distinction with respect to month is not necessary in contrast to other emitter categories.

An example of the method of investigations via the collective approach in the transportation category is given in addendum V.

4. Data Processing

4.1 Feeding the Data Files

When operating the emissions inventory as a computerized data bank the information contained in the coding forms are fed into the data bank by load routines. The coordination of the data to the data files can be seen from the following table 2.

Table 2: Association of information and data files

Data Collection Method	Stage	Data Files				Emitter Category (typical)
		Operator	Plant	Emission	Source	
individual approach		x	x	x	x	industry
collective approach	1	(x)	x	x	-	domestic heating
	2	-	$x^{+)}$	-	-	
	1	-	-	-	-	traffic
	2	-	-	x	x	

+) including source information

Investigating via an individual approach the contents of the coding forms are completely attached to a data file.

The information of the plant standards referring to space heatings and minor industry (1. stage of the collective approach) are associated to the data files operator, plant and emissions. These representative plants have a fictitious operator and do not have a source in the sence of the emissions inventory systematics. The data collection for domestic heatings and minor industries (2. stage of the collective approach) are fed into the plant data file, they furthermore include information concerning the sources.

The emission factors developed in the category traffic (1. stage of the collective approach) are not fed into any of the data files. The data collected in the coding form STREET TRAFFIC (2. stage of the collective approach) are fed into the data files emissions and sources.

The data bank contains

- the complete information on emissions, when data are investigated via an individual approach
- an information on emissions with respect to the plant standards only, when data are investigated via a collective approach
- information on emissions only indirectly e. g. in the form of traffic densities, when data are investigated via a collective approach with the aid of emission factors not introduced into a data file.

4.2 Data Evaluation and Application

The data bank emissions inventory allows the complete description of the emissions situation of the region under study. Evaluation routines give answers to many questions which, however, must be in accordance with the emissions inventory systematics. The simplest "evaluation" corresponds to a listing of the input data. Every other evaluation requires a selection of data in accordance with detailed criteria.

For the use of the emissions inventory there are available a flexible selection program as well as special evaluation programs. The flexible selection program allows the reduction of the data being available in the data bank to an amount of data which are necessary for the special evaluation program. Nearly all kind of data may be used as selection criteria for the flexible program.

During the application of the emissions inventories within the establishment of clean air plans out of the about 20 special selection programs the following were used mainly to answer the questions:

- annual emissions of all air pollutants involved in the emissions inventory,
- annual emissions of selected air pollutants within (maximum 12000) grids,
- annual emissions of selected air pollutants at different source heights,
- time dependence of the emissions of selected air pollutants as hourly averages,
- selection of the 20 plants or sources with the highest total emissions of selected air pollutants including the plants' or sources' shares to the overall emissions,
- selection of those sources, of which the mass flow or mass concentration of selected air pollutants is beyond certain limits.

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4.2 Data Evaluation and Application

The data bank emissions inventory allows the complete description of the emissions situation of the region under study. Evaluation routines give answers to many questions which, however, must be in accordance with the emissions inventory systematics. The simplest "evaluation" corresponds to a listing of the input data. Every other evaluation requires a selection of data in accordance with detailed criteria.

Most of these evaluations result in a more or less global information about the emissions situation in the investigated area. A further application referring to more detailed data serves the purposes of analysing high air pollution loads. Via dispersion model calculations the shares of the relevant sources and thus the responsible plants and operators for high pollution loads can be traced.

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Addendum I: Classification Codes

1. Source Classification Codes

2. Plant Classification Codes

The description of the technical state of a facility is done by a 4-digit code for the kind and type of a plant. The "kind" represents a rough and the "type" a more detailed information about the plant.

The following gives an extract of the catalogues of codes for the kinds and the codes for the types (of two kinds of plants).

2.1 Classification Codes for Kinds of Plants

2.2 Classification Codes for Types of Plants

1. Source Classification Codes

source specification	code
single stack with free discharge	10
stack with separate tubes and free discharge	11
other major outlets	19
leakage of a plant	20
building outlets	21
storage facility	22
dump	23
minor factory	24
other single sources	29
street in the local traffic	30
crossing in the local traffic	31
place in a closed village	32
road	33
highway	34
expressway	35
railway line	40
railway area	41
subsiding basin	50
clearing basin	51
cooling pond	52
stream	53
river	54
channel	55
other waters	56
industrial area	60
residential area	70
area of minor industries	71
sewer system	72
road-network within closed villages	80

2.1 Plant Classification Codes - kinds of plants

Kind specification	code
gas-cleaning facilities	00
gasoline engines	01
refuse disposal plants	02
facilities to change state of aggregation	03
heat exchangers	04
fireplaces for domestic heating	10
fireplaces and combustion facilities of minor industry	11
firings of steam-, hot-water- and warm-water boilers	12
air heaters	13
furnaces for heating of organic heat carriers	14
furnaces for heating of other heat carriers	15
furnaces for evaporation, vaporization and cracking	16
combustion chamber	17
other furnaces	19
facilities for roasting	20
facilities for refining	21
facilities for calcining	22
facilities for hydrolysing	23
facilities for electrolysing	24
facilities for depositing	25
facilities for cracking	26
facilities for polymerizing, cross-linking, vulcanizing	27
facilities for oxidizing	28
facilities for synthesis (large scale processes)	29
facilities for reducing	30

Continuation

Kind specification	code
facilities for hydrogenizing	31
facilities for dehydrogenizing	32
facilities for nitriding	33
facilities for sulfurizing	34
facilities for halogenating	35
facilities for hydrating	36
facilities for alkylation	37
facilities for acrylising	38
facilities for dry distillation	39
facilities for esterifying	40
facilities for saponifying	41
facilities for diazotizing	42
facilities for refining and concentrating	43
facilities for chemical condensation	44
facilities for neutralisation	45
facilities for chemical conversion	46
facilities for substitution	47
facilities for biochemistry	48
other facilities for chemical reaction technique	49
facilities for separation of solids	50
facilities for separation of liquids and gases from solids	51
facilities for separation of liquids and gases from mixtures	52
facilities for combination of material	53
facilities for conveying of media	60
bottling facilities	61
storage facilities	62
facilities for fabrication and processing	70
facilities for heat-treatment of working pieces	71

Continuation

Kind specification	code
facilities for surface-coating	72
other facilities	79
production methods	83
gaskets (admitted with liquids)	90
gaskets (admitted with gases/vapors)	91
stuffing boxes (admitted with liquids)	92
stuffing boxes (admitted with gases/vapors)	93
shaft packing (admitted with liquids)	94
shaft packing (admitted with gases/vapors)	95
shutoff device (admitted with liquids)	96
shutoff device (admitted with gases/vapors)	97

2.2 Classification Codes for Types of Plants

Example 1: Facilities for refining

Type specification	code of kind	code of type
open vessel	21	01
open vessel with mixing equipment	21	02
closed vessel	21	03
closed vessel with mixing equipment	21	04
autoclave	21	08
blast furnace	21	10
rotary kiln	21	11
fluidized bed furnace	21	20
SM - furnace	21	96
LDAC - converter	21	97
LD - converter	21	98

Example 2: Facilities for separation of liquids and gases from mixtures

Type specification	code of kind	code of type
evaporation	52	01
distillation column	52	02
rectification	52	03
stripping column	52	04
vacuum distillation	52	05
vacuum degassing	52	06
vacuum evaporator	52	07
thin-film evaporator	52	08
other distillation plants	52	09

Addendum II: Coding forms
(including explanatory remarks of the spaces)

SUBSTANCE DATA

SUBSTANCE GROUP DATA

OPERATOR DATA

SOURCE DATA

PLANT DATA

EMISSION DATA

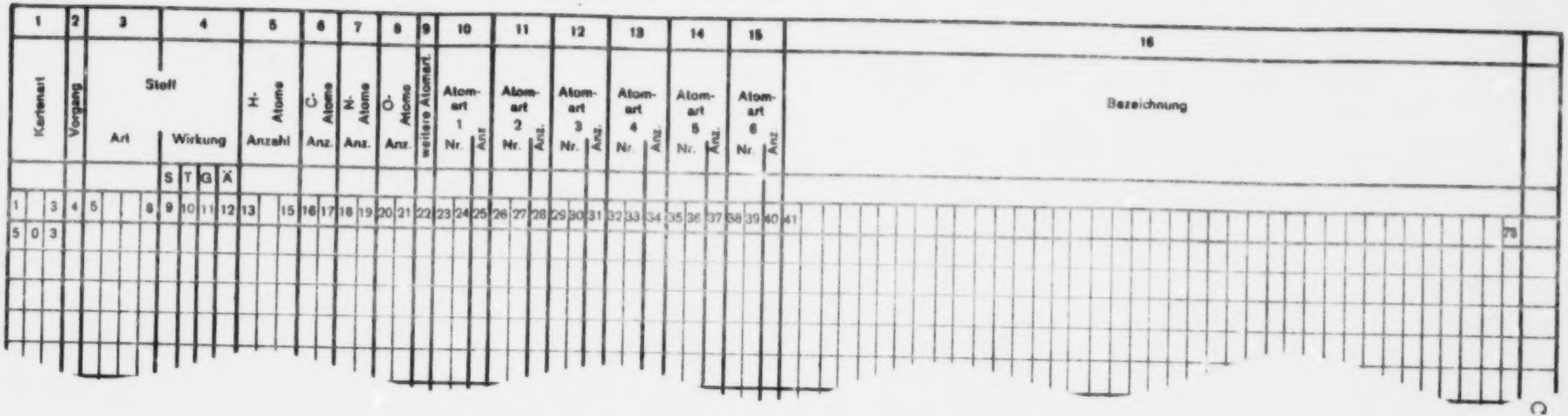
MODE TEXT

FIREPLACES in SPACE HEATING and MINOR INDUSTRY

MINOR INDUSTRY (Fireplaces excluded)

STREET TRAFFIC

Coding Form SUBSTANCE DATA



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Kartenart	Vorgang	Stoff		H-Atome	C-Atome	N-Atome	O-Atome	weitere Atomart	Atom-art 1	Atom-art 2	Atom-art 3	Atom-art 4	Atom-art 5	Atom-art 6	Bezeichnung
		Art	Wirkung	Anzahl	Anz.	Anz.	Anz.		Nr. Anz.	Nr. Anz.	Nr. Anz.	Nr. Anz.	Nr. Anz.	Nr. Anz.	
			S T G Ä												
1 3	4	5 8	9 10 11 12	13 15	16 17	18 19	20 21	22	23 24 25	26 27 28	29 30 31	32 33 34	35 36 37	38 39 40	41 78
5 0 3															

C-31

Spaces	Contents
1 - 3	Card identification
4	Procedure: entry, deletion, modification
5 - 8	Substance no.
9 - 12	Effect of substance: soiling, toxic, smelling intensively, etching
13 - 15	Number of H-atoms
16 - 17	Number of C-atoms
18 - 19	Number of N-atoms
20 - 21	Number of O-atoms
22	Number of further elements
23 - 25	Atomic no. and number of further atom with lowest atomic no.
26 - 28	Atomic no. and number of further atom with 2nd lowest atomic no.
.	
.	
.	
41 - 78	Substance name

Coding Form SUBSTANCE GROUP DATA +)

Basic Card

1	2	3	4				5	6	7	8	9		10		11		12		
Kartenart	Vorgang	Stoff					Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente		2. Komponente		3. Komponente		4. Komponente		
		Art	Wirkung								Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	
			S	T	G	A						%		%		%		%	
1 3	4	5 8	9	10	11	12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78	
5 0 4							1												

Continuation Card

5	6		7		8		9		10		11		12		13		14		15		16		
Karte Nr.	5. Komponente		6 Komponente		7. Komponente		8. Komponente		9 Komponente		10 Komponente		11. Komponente		12. Komponente		13. Komponente		14 Komponente		15 Komponente		
	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	
		%		%		%		%		%		%		%		%		%		%		%	
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79	
2																							

Spaces	Contents
1 - 12	See coding form SUBSTANCE DATA
13	Card no.
14	Number of continuation cards
15 - 16	Number of components (max. 20)
17 - 54	Substance group name
55 - 60	Substance no. and percentage of 1st component
61 - 66	Substance no. and percentage of 2nd component

+) This coding form serves to store substance groups consisting of substances coded already in the substance data file.

Coding Form OPERATOR DATA

1	2	3	4	5	6	7	8	9	10	11
Kartenart	Vorgang	Betreiber Nr.	Stand-ort Nr.	Branche	Name, Firmenbezeichnung	Postleit-zahl	Wohnort, Betriebsort	Straße, Hausnummer	Zust. Be-hörde	Telefon-Nr. (Ortsnetz)
1 3	4	5 9	10 12	13 14	15 34	35 37	38 55	56 71	72 74	75 80
5 0 0										

Spaces	Contents
1 - 3	Card identification
4	Procedure: entry, deletion, modification
5 - 9	Operator no.
10 - 12	Site no.
13 - 14	Industrial branch no.
15 - 34	Company's name
35 - 71	Postal address: code, city, street
72 - 74	Licencing authority / control agency
75 - 80	Telephone no.

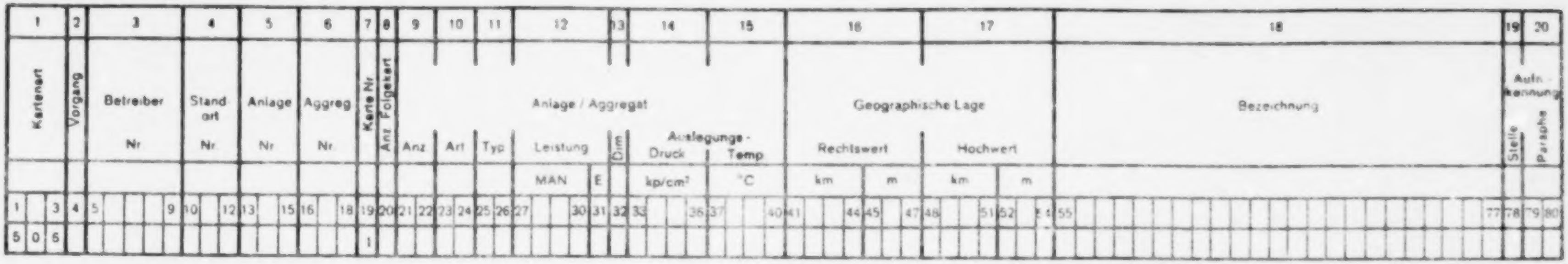
Coding Form SOURCE DATA

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Kartenart	Vorgang	Betreiber	Standort	Quelle		Geographische Lage		Geodät. Höhe	Geometr. Höhe	Quellenabmessungen					Gasreinigungsanlage / Typ	Gemeindekennziffer	Zust. Behördes	Aufn. kenng.		Bezeichnung
		Nr.	Nr.	Nr.	Art	Rechtswert	Hochwert			Fläche	Länge	Breite	Höhe	Winkel				Stelle	Paraphe	
						km m	km m	m	m	MAN E	m	m	m	Grad						
1 3	4	5 9	10 11 12	13 15	16 17	18 21 22 24	25 28 29 31	32 34	35 37	38 42	43 46	47 50	51 54	55 57	58 59	60 63	64 66	67	68 69	70 80
5 0 1																				

Spaces	Contents
1 - 12	See coding form OPERATOR DATA
13 - 15	Source no.
16 - 17	Kind of source
18 - 24	X-coordinate)of geographical position
25 - 31	Y-coordinate)of geographical position
32 - 34	Geodetic height
35 - 37	Geometric height
38 - 54	Source dimensions: cross section, length, width, height
55 - 57	Angle to north
58 - 59	Type of control device
60 - 63	Communal code
64 - 66	Control agency
67 - 69	Recording institution
70 - 80	Description

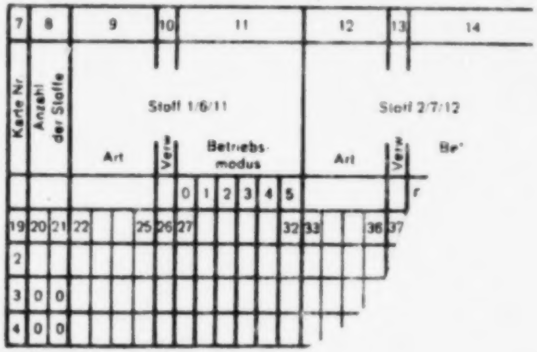
Coding Form PLANT DATA

Basic Card



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Kartenart
Vorgang
Betreiber Nr
Stand ort Nr
Anlage Nr
Aggreg Nr
Karte Nr
Anz Folgekart
Anlage / Aggregat
Anz
Art
Typ
Leistung
MAN
E
Dim
Auslegungs-
Druck
kp/cm²
Temp
°C
Geographische Lage
Rechtswert
km
m
Hochwert
km
m
Bezeichnung
Aufn.-kennung
Stelle
Paraphe
1 3 4 5 9 10 12 13 15 16 18 19 20 21 22 23 24 25 26 27 30 31 32 33 36 37 40 41 44 45 47 48 51 52 54 55 77 78 79 80
5 0 6
1

Continuation Cards



7 8 9 10 11 12 13 14
Karte Nr
Anzahl der Stoffe
Stoff 1/6/11
Art
Verw
Betriebs-modus
0 1 2 3 4 5
Stoff 2/7/12
Art
Verw
Be'
19 20 21 22 25 26 27 32 33 36 37
2
3 0 0
4 0 0

Spaces	Contents	
1 - 18	See coding form EMISSION DATA	
19	Card no.	
20	Number of continuation cards (max. 3)	
21 - 22	Number of units	
23 - 24	Kind	of plant/ aggregate
25 - 26	Type	
27 - 31	Nominal capacity	
32	Unit of capacity	
33 - 36	Nominal pressure	
37 - 40	Nominal temperature	
41 - 47	X-coordinate	of geographical position
48 - 54	Y-coordinate	
55 - 77	Description	
78 - 80	Recording institution	

Continuation Card

19	Card no.
20 - 21	Number of substances (up to 15)
22 - 25, 33 - 36, ...	No. of substances
26, 37, ...	Use: (raw material, product, substances)
27 - 32, 38 - 43, ...	Operating modes (up to 6) of substances

.
.
.

Coding Form EMISSION DATA

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Kartenart	Vorgang	Betreiber	Standort	Anlage	Aggregat	Quelle	Leistung in % d Nennleist	Emittierter Stoff				Abgas				Emissionsmodus	Betriebsmodus	Erw Betriebsmod	Haufigkeit	Zeitdauer	Zeitangabe			Gasreinigungsanlage			Ermittlung		Aufn.-kenng		Sonderprogramm	Satz Nr	
		Nr	Nr	Nr	Nr	Nr		Art	P	Massenstrom	S	Art	Volumenstrom	S	Temp						Monat	Tag	Stunde	Nr	Typ	Leistung	Art	Jahr	Stelle	Paraphe			
							%			MAN E	%		MAN E	%	°C				D	D	A E	A E	A E			% 1/10							
1 3	4	5 9	10 12	13 15	16 18	19 21	22 23	24 27	28	29 32 33	34 35	36	37 40 41	42 43	44 47	48 49	50	51	52 53 54	55 56 57	58 59	60 61	62 63	64	65 66	67 68 69	70	71 72	73	74 75	76	77 79	80
5 0 2																																	

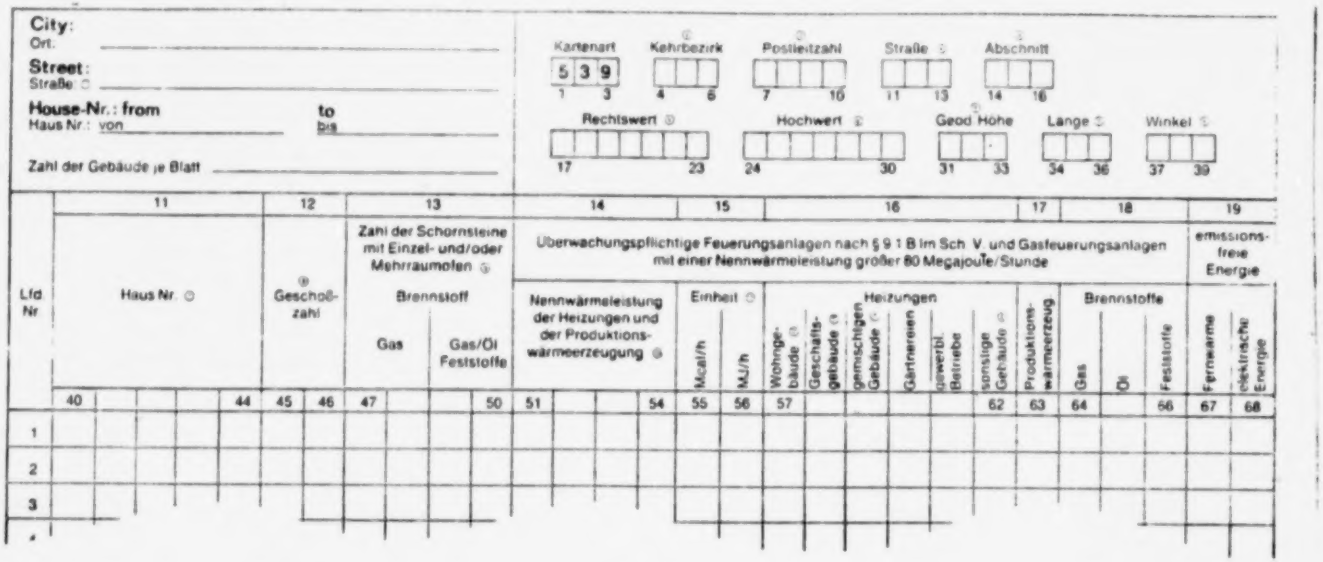
Spaces	Contents	
1 - 12	See coding form OPERATOR DATA	
13 - 15	Plant no.	
16 - 18	Aggregate no.	
19 - 21	Source no.	
22 - 23	Capacity of plant/aggregate as percentage of nominal capacity	
24 - 27	Kind	of emitted substance
28	Phase (solid, fluid, ...)	
29 - 33	Mass flow (behind control device)	
36	Kind (pure, deluted)	of flue gas
37 - 41	Volume flow	
44 - 47	Temperature (at the source)	
48 - 49	Emission mode	
50	Operating mode	
51	Extended operating mode	
52 - 54	Frequency (e. g. twice a week)	
55 - 57	Duration (e. g. three hrs. each)	
58 - 63	Time: (month, day, hour) (e. g. Oct. thr. May, Mo. thr. Fri. 8 thr. 17 hrs.)	
64	No.	of control device
65 - 66	Type	
67 - 69	Efficiency	
70	Kind of recording	
71 - 72	Year of recording	
73 - 75	Recording institution	

Coding Form MODE TEXT

1	2	3	4	5	6	7	8	9	10	11
Kartenart	Vorgang	Betreiber Nr.	Stand-ort Nr.	Anlage Nr.	Aggre-gat Nr.	Quelle Nr.	Emissionsmodus	Betriebsmodus	Erw. Betriebsmod.	Bezeichnung
1 3	4	5 9	10 12	13 15	16 18	19 21	22 23	24	25	26 80
5 0 8										

Spaces	Contents
1 - 21	See coding form EMISSION DATA
22 - 23	Emission mode
24	Operating mode
25	Extended operating mode
26 - 80	Description of operation and/or emission conditions

Coding Form FIREPLACES IN SPACE HEATING AND MINOR INDUSTRY



City:
Ort:

Street:
Straße:

House-Nr.: from **to**
Haus Nr.: von bis

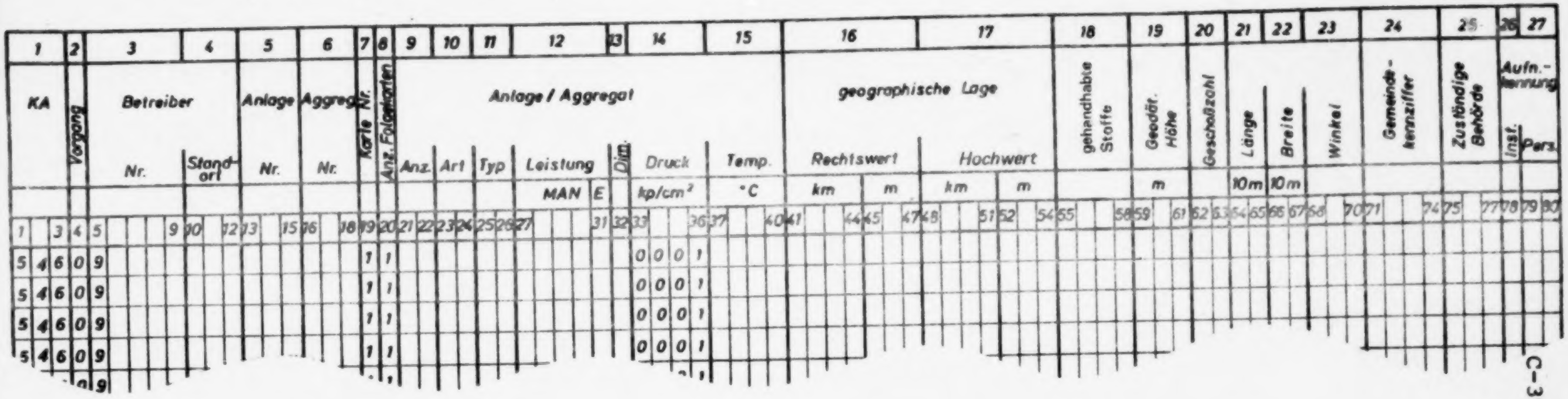
Zahl der Gebäude je Blatt

Kartenart 5 3 9 (1–3)
Kehrbezirk (4–6)
Postleitzahl (7–10)
Straße (11–13)
Abschnitt (14–16)
Rechtswert (17–23)
Hochwert (24–30)
Geod Höhe (31–33)
Länge (34–36)
Winkel (37–39)

	11	12	13		14	15		16						17	18			19	
			Zahl der Schornsteine mit Einzel- und/oder Mehrraumöfen		Überwachungspflichtige Feuerungsanlagen nach § 9 1 B Im Sch. V. und Gasfeuerungsanlagen mit einer Nennwärmeleistung größer 80 Megajoule/Stunde													emissionsfreie Energie	
Lfd Nr	Haus Nr.	Geschoßzahl	Brennstoff		Nennwärmeleistung der Heizungen und der Produktionswärmeerzeugung	Einheit		Heizungen						Produktionswärmeerzeugung	Brennstoffe				
			Gas	Gas/Öl Feststoffe		Mcal/h	MJ/h	Wohngebäude	Geschäftsgebäude	gemischtgen Gebäude	Gärtnereien	gewerbl. Betriebe	sonstige Gebäude		Gas	Öl	Feststoffe	Fernwärme	elektrische Energie
	40 44	45 46	47	50	51 54	55	56	57					62	63	64		66	67	68
1																			
2																			
3																			
4																			

Spaces	Contents
1 - 3	Card identification
4 - 6	Sweeping district
7 - 10	Postal code
11 - 13	Code no. of street
14 - 16	Section no.
17 - 30	X, Y coordinates of central point
31 - 33	Geodetic height
34 - 36	Length of section
37 - 39	Angle to north
40 - 44	House no.
45 - 46	Number of floors
47 - 50	Number of chimneys with single or multi room ovens
47 - 48	Fuel = gas
49 - 50	Fuel = gas and/or oil and/or coal
51 - 67	Fireplaces subject to supervision (acc. to Fed. Imm. Prot. Act) and gas-fired fireplaces exceeding 80 MJ/h
51 - 54	Nominal heating capacity
55 - 56	Unit of heating capacity
57 - 65	Room heating installations
57	Residential home
58	Office building
59	Mixed use building
60	Market gardens
61	Industrial trade establishment
62	Other buildings
63	Production heat generation
64 - 66	Fuels
64	Gas
65	Oil
66	Coal/wood
67	Destrict heating
68	Electric heating

Coding Form MINOR INDUSTRY (Fireplaces excluded)



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
KA	Vorgang	Betreiber		Anlage	Aggreg	Karte Nr.	Anz. Folgekarten	Anlage / Aggregat							geographische Lage		gehandhabte Stoffe	Geodät. Höhe	Geschoßzahl	Länge	Breite	Winkel	Gemeinde-kennziffer	Zuständige Behörde	Aufn.-kennung	
		Nr.	Standort	Nr.	Nr.			Anz.	Art	Typ	Leistung	Dim.	Druck	Temp.	Rechtswert	Hochwert									Inst.	Pers.
											MAN E		kp/cm²	°C	km m	km m		m		10m	10m					
1 - 3	4	5 - 9	10 - 12	13 - 15	16 - 18	19	20	21 - 22	23 - 24	25 - 26	27 - 31	32	33 - 36	37 - 40	41 - 44 45 - 47	48 - 51 52 - 54	55 - 58	59 - 61	62 - 63	64 - 65	66 - 67	68 - 70	71 - 74	75 - 77	78	79 - 80
5 4 6	0	9				1	1						0 0 0 1													
5 4 6	0	9				1	1						0 0 0 1													
5 4 6	0	9				1	1						0 0 0 1													
5 4 6	0	9				1	1						0 0 0 1													
	0	9					1						1													

Spaces	Contents
1 - 54	See coding form PLANT DATA
55 - 58	No. of substance handled
59 - 61	Geodetic height
62 - 63	Number of floors
64 - 65	Length of source
66 - 67	Width of source
68 - 70	Angle to north
71 - 74	Communal code
75 - 77	Control agency
78 - 80	Recording institution

Coding form STREET TRAFFIC

EMISSIONSKATASTER STRASSENVERKEHR

Bezirk : District
Strasse : Street
Abschnitt : Section

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
KA	Betreiber Nr.	Standort Nr.	Quelle Nr.	Länge der Quelle m	Fahrzeugart	Fahrmodus	Zeile Nr.	Anzahl		Zeitangabe		Nachweis			
									S %	Tag von bis	Uhrzeit von bis	Art	Jahr	Institut	Paraphe
1 2 3	4 5 6 7 8	9 10 11	12 13 14	15 16 17 18	19	20	21	22 23 24 25	26 27	28 29	30 31 32 33	34	35 36	37	38 39
5 1 2															

Spaces	Contents
1 - 3	Card identification
4 - 8	Operator no. (ficticious)
9 - 11	Site no (ficticious)
12 - 14	Source no.
15 - 18	Length of source
19	Kind of vehicle
20	Driving mode
21	Line no.
22 - 25	Number of vehicles
28 - 33	Time
28 - 29	Day from ... to
30 - 33	Hour from ... to
34	Kind of recording
35 - 36	Year of recording
34 - 39	Recording institution

Addendum III: Questionnaire forms for emissions declarations and for investigation of minor industry

Appendix I
Page 1

To[1)]

Works No.**

....

Industry branch No.**

....

Emission declaration/updating of the emission declaration*

Declaration serial No.[2)]

Declaration for the period:

1. Firm name

nature of business: Tel.: (with dialling code)

Postal address:

Person to contact regarding this report

Department: Name: Tel.: (with dialling code)

2. Plant

Name of the installation or work where the plant has been in operation:

Postal address: Boundary: Lot:

Nature and purpose of the plant:

Number/description of the plant:[3)]

Previous official authorization with regard to § 67 par. 2 of the Federal Immission Protection Act

Authority: Ref. No.: Date:

3. Emissions

a) Have emissions emanated from the plant[4)] yes/no*

b) Have there been any significant changes since the previous investigation[5)] yes/no/applicable*

4. Operating time

a) Has the plant ever not been in use or shut down yes/no*

Date of cessation of operations/shut down*

Date of resumption of operations;

b) Operation hours:

---

*) delete where inapplicable
**) for office use only

Appendix I
Page 2

5. Fuel and working media, sources

a) The following fuel and working media were used, processed and transshipped.

Substance[6)]	Quantity t/a	Analysis[7)]		Use
		Constituent parts	Percentage by weight	
1	2	3	4	5

b) The table contains all working media yes/no*
Number of the listed working media

c) Sources**

exit height above ground m

exhaust surface m^2

6. Shift operation (primarily)*

a) One shift operation

b) Two shift operation

c) Three shift operation

7. Seasonal operation from to

8. Extent of the emission report

Appendix II	Page	to	
Appendix III	Page	to	
Appendix IV	Page	to	

9. The following institute(s) organisation(s) have co-operated in the determination of emissions and the compilation of the report.

....
Date Official signature

Note: See § 52 Par. 5 of the Federal Immission Protection Act.

---

*) Delete where inapplicable
**) Only to complete, if the emission report exists only of Appendix I

Appendix II
Page ......

Emission declaration/updating of the emission declaration*

Declaration for the period* ....

Plant and Aggregates

Description of the plant	Aggregate 8)		Mode of operation		Waste gas control techniques 9)
	Description	Serial-no.	continuous	intermittet	
1	2	3	4	5	6

---

*) delete where inapplicable

Appendix III
Page ......

Emission declaration/updating of the emission declaration*

Declaration for the period ....

Sources

10) Serial No. of source	11)' description of source	12) conected to		13) geographical location		temperature of waste gas	for surface sources 14)				
		plant (description)	aggregate No.	x coordinate m	y coordinate m	°C	exit height above ground m	exhaust surface m^2	length m	a) width b) height m	angle to north vector
1	2	3	4	5	6	7	8	9	10	11	12

---

* delete where inapplicable

Appendix IV
Page .....

Emission declaration/updating of the emission declaration*

Declaration for the period ....

Mode of operation/emissions

15) desription of the plant	10) 16) Serial No. of source	8) 17) aggregate No.	mode of operation				22) exhaust blast m³/hr	emissions					
			18) oper-ational process	19) frequency and re-spective duration	20) time data	21) total duration hr		23) substance	24) state of ag-grega-tion	25) mass-		26) total mass	27) determi-nation method
										concen-tration mg/m³	flow		
1	2	3	4	5	6	7	8	9	10	11	12	13	14

---

* delete where inapplicable

Emissions Inventory Data for Trade and Minor Industry

A

of The Land Institution for Environmental Control
of North Rhine-Westphalia

Questionnaire Form A: General Data

1. Operator data

Firm, name: ________________________

Postal address: ________________________
(Street, No., Postal code, city)

County: ________________________

Tel.-No.; ________________
(with dialling code)

Person to contact regarding this report:

at the operator (Tel.-No. as before): Mr. ____________

by the authority

in ________________________ Mr. ____________

2. General plant data

2.1 Nature of the plant*) ________________________

____

2.2 Location of the plant:

City: ________________________

Street, No. ________________ County: ________________

2.3 Geographical Location**) and height above sea level:

x coordinate							y coordinate						
km				m			km				m		

geod. height		
m		

*) General name of the plant, for which the data are collected by the following questionnaire forms (T, H1, CR1, CR2, D1, D2, L1, L2, L3)

**) The geographical location of the plant is to be declared by the center point coordinates (x/y) of the plant.

working place-No.***)						

***) Code which allows to identify the branches of industry, minor industry, trade etc.

Emissions Inventory Data for Trade and Minor Industry

T

of The Land Institution for Environmental Control
of North Rhine-Westphalia

Questionnaire Form T: Filling station

date of issue ____________ (date) by ____________ (name)

1. Fuel sale

gasoline (high octane) ________ m³/yr.
gasoline (normal) ________ m³/yr.
gas oil m³/yr.

---

total ________ m³/yr.

2. Fuel delivery

(frequency per year and mass of filling)

gasoline (high octane) for _____ times per year ________ liter
gasoline (normal) for _____ times per year ________ liter
gas oil for _____ times per year ________ liter

3. Outlet of the gases in connection with fuel delivery by tank-car

Shuttle gas line: yes ☐ no ☐

Exit height of the outlet*) above ground ________ m

4. Opening time

Monday to Friday from ________ hr to ________ hr
Saturday from ________ hr to ________ hr
Sunday from ________ hr to ________ hr

*) Outlet of the gases with shuttle gas line may end at gasoline pump.

☐☐☐☐☐☐☐
working place-No.

Emissions Inventory Data for Trade and Minor Industry

D1

of The Land Institution for Environmental Control
of North Rhine-Westphalia

Questionnaire Form D: Printing

date of issue ____________ (date) by ____________ (name)

1. Operating time of the printing

Monday to Friday from ______ hr to ______ hr
Saturday from ______ hr to ______ hr
Sunday from ______ hr to ______ hr

2. Printing colour and solvent consumption

The annual consumption for each printing method*) and each colour and each solvent must be declared separatly.

2.1 Printing colour purchase

manufacturer	type (manufacture)	mass kg/yr.	type of printing

*) e.g. relief-printing, copperplate printing, etc.

working place-No.						

D2

2.2 Solvent purchase

manufacturer	type (manufacture)	mass kg/yr.	purpose R=cleaning V=dilution	type of printing

3. Waste gas outlet and recovery of solvents

3.1 Emission height above ground _________ m

3.2 Recovery-plant

yes ☐ no ☐

3.3 Sale of recovered solvents

mass of sale kg/yr.	substance (e.g. Toluene)	type of recovery-plant

working place-No.						

Emissions Inventory Data for Trade and Minor Industry

CR1

of The Land Institution for Environmental Control
of North Rhine-Westphalia

Questionnaire Form CR: dry cleaning*)

date of issue ____________ by ____________
(date) (name)

1. Existing dry cleaning machines

machine No.**)	detergent	mass of clothing kg/charge	duration for each charge minutes	numbers of charge per day	manufacture/ machine
1					
2					
3					
4					
5					

2. Operating time of the dry-cleaning machines

Monday to Friday from ________ hr to ________ hr
Saturday from ________ hr to ________ hr

3. Detergent consumption (subsequent delivery for loss on detergent)

Dry-cleaning machines

________ kg/liter ________ per day/week/month***)
________ kg/liter ________ per day/week/month
(Trichloro-, Tetrachloroethyline, etc.)

Detach

________ kg/liter ________ per day/week/month
________ kg/liter ________ per day/week/month
(Trichloro-, Tetrachloroethyline, etc.)

*) Only facilities with regards to the 2nd ordinance of the Federal Immission Protection Act

**) If there are more than 5 machines, please use a second form type CR1

***) delete where inapplicable

working place-No.						

4. Waste gas outlet, waste gas control installation and emissions

machine No.*)	waste gas control installation		height of the outlet	emissions (measurements) ***)	frequency of regeneration***)
	kind**)	manufacture	m	ppm	per day
1					
2					
3					
4					
5					

*) If there are more than 5 machines, take a new form CR2

**) For the kind of waste gas control installation use the following codes

1	=	Condenser with freezing-apparatus and air-pump (e.g. for fluor-hydrocarbons)
2	=	Charcoalfilter, only one apparatus
2.1	=	with switching to exhaust from the floor, when the dry-cleaning machines do not operate
2.2	=	without exhaust of the floor
3	=	two or more charcoalfilters in changing operation
3.1	=	with exhaust of the floor
3.2	=	without exhaust of the floor

***) If there are more than one dry cleaning machine installed at one waste gas control installation, so declare in the table. The frequency of regeneration for each waste gas control installation has to be declared.

working place-No.						

Emissions Inventory Data for Trade and Minor Industry

L 1

of The Land Institution for Environmental Control
of North Rhine-Westphalia

Questionnaire Form L: Japanning works*)

date of issue ________________ by ________________
(date) (name)

1. Operating time

Monday to Friday from ________ hr to ________ hr

Saturday from ________ hr to ________ hr

2. Type of japanning

☐ a Spraying with spray gun without static loading
  ☐ a 1 with compressed air
  ☐ a 2 with high pressure but airless
☐ b Spraying with electrostatical spray gun
☐ c Dip-coating

3. Monthly consumption

type of japanning **)				type of varnisch ***)	varnisch consumption		drying apparatus-No. ****)
					kg/month	with drying in % of consumption	
a_1	a_2	b	c				
a_1	a_2	b	c				
a_1	a_2	b	c				
a_1	a_2	b	c				
a_1	a_2	b	c				

---

*) Japanning work lower than subject of licence with regard to the 4th ordinance of the Federal Immission Control Law

**) mark with a cross where applicable

***) e.g. nitrocellulose dope (NC), combination dope with NC, acrylic resin dope, polyurythane dope, phenolic resin dope, melamin resin dope

****) in case a drying apparatus exists form L3 must be added

working place-No.						

L2

4. **Description of japanning stands**

This form must be added separately for each different japanning method.

Type of japanning (same as form L1):

*)

a_1	a_2	b	c

☐ within __________ splash cabin(s) with exhaust
(number)

☐ with mist cleaner

☐ without mist cleaner

Outlet height above ground __________ m

☐ before splash board with exhausting

☐ with mist cleaner

☐ without mist cleaner

Outlet height above ground __________ m

☐ before an open splach board in a working hall or equivalent

height of the working hall above ground __________ m

☐ within __________ dipping coat(s) with __________ m^3 exhaust
(number)

surface for each.

☐ without exhaust

☐ with exhaust

*) mark with a cross where applicable

working place-No.						

L 3

5. Drying apparatus/Waste gas outlet

Drying apparatus No. __________ *)

Drying chamber/drying stove/drying cabin**)

☐ hot-air desiccation up to __________ °C

heating input __________ kJ/hr

☐ electric energy

☐ gas __________ m³ per month/year**)

☐ fuel oil "EL" __________ litre per month/year

☐ radiant drying up to __________ °C

Exit height of emissions above ground __________ m.

6. Waste gas control installation, emission measurements

Waste gas control installation yes☐ no☐

Type of waste gas control installation (e.g. direct flame after burner, catalytic after burner)

☐ drying apparatus fall under the 7th ordinance of the Immission Protection Act of North Rhine-Westphalia.

Measurement result __________ mgC/m³

*) The No. of the drying apparatus is the same as on form L1

**) delete where inapplicable

working place-No.						

Addendum IV: Example of an investigation via the individual approach - power plant

1. Description of the power plant

2. Assembling data files

2.1 Assembling operator data and plant data file

2.2 Assembling source data file

2.3 Assembling emission data file
2.3.1 Potential causes of emissions
2.3.2 Emissions of the boilers
2.3.3 Emissions of the fuel tanks and cooling towers
2.3.4 Complete output of the data file

2.4 Assembling substance data file

1. Description of the power plant

As an example the emission characteristics of a steam boiler plant are to be examined. The amount of steam necessary for electric power and heating is generated in 5 high pressure steam boilers. The important technical data relating to these boilers and for the analysis of the emissions are to be found in Table 1. The assembly of the boilers including the supporting plant parts as fuel stores and cooling towers as well as of the sources is to be seen from the site plan (Fig. 1).

As can be seen from the site plan, boilers 1 to 3 are joint to one single stack (source 1) whereas boilers 4 and 5 are joint to own stacks (sources 2 and 3). The outlets of the 3 fuel storage tanks are fed together to one source (source 4). The cooling towers are handled as single sources each (sources 5 and 6).

The boilers are in operation as follows:

a) basic load

- boilers 1 or 2	during summer
- boilers 1 and 2	during winter
- boilers 4 and 5	throughout the year

b) peak load

- boiler 3	if required.

Table 1: Design and construction data of the steam boilers

Boiler No.	1	2	3	4	5
No. on boiler name plate	2354	2355	3421	5316	3519
Max. continuous (steamflow) capacity t/hr	50	50	100	125	125
Licence pressure bar	42	42	67	136	136
Working pressure bar	40	40	64	129	129
Superheated steam temperature K	723	723	723	798	798
Feedwater temperature K	383	383	413	413	413
Furnace type	stoker firing with undergrate blower		fuel oil firing with atomizer	pulverized coalfiring with dry ash removed	
Fuel type	bituminous nut size IV		fuel oil "S"	fat slurry coal	rough lignite
Lower calorific value kJ/kg	31400	31400	41030	30100	8370
Dust collector type	cyclone dust separator		-	horizontal electrostatic dust separator	
Furnace capacity kcal/hr	40	40	75	93	98
kJ/hr	168	168	315	391	412

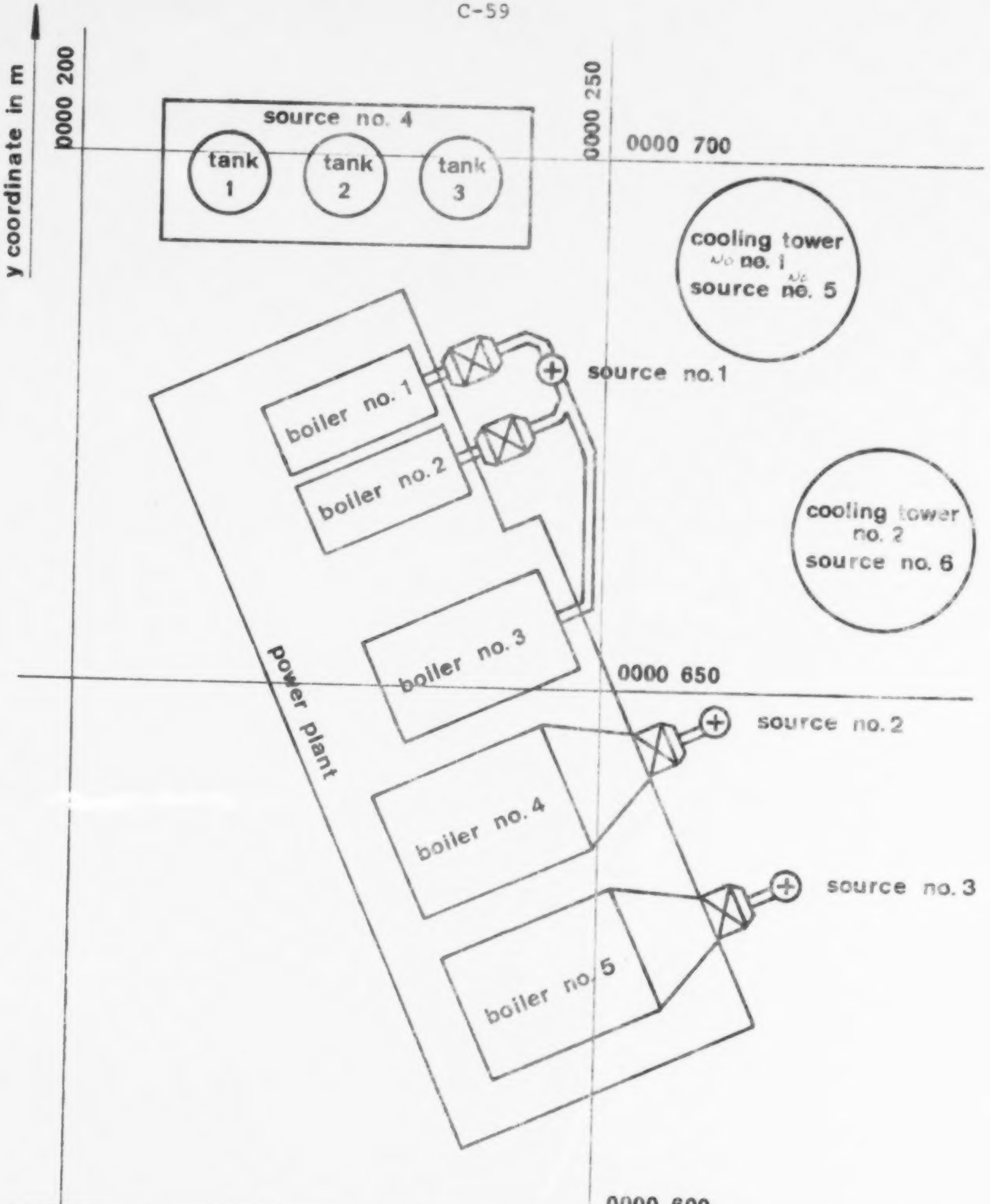


Fig. 1: Site plan with details of sources

The technical details of the fuel tanks and cooling towers are summarized in Table 2. Table 3 reflects the details of the different sources.

So all data are available to complete the coding forms for the plant and source data files as well as the operator data file.

2. Assembling Data files

2.1 Assembling the operator data and plant data file

The code number of operator and site will be defined by a central agency for the emissions inventories. The completed coding form is reproduced in Fig. 2. The plant under investigation that is situated in the control region receives the site code number 001. Site code number 000 is reserved for the company's head quarter.

The plant data can now be collected. Following an emissions analysis a grouping with the following plant/aggregate numbers proves suitable:

001 000	power plant
001 010	boilers 1 and 2
001 011	boiler 1
001 012	boiler 2
001 020	boiler 3
001 021	fuel oil stores
001 030	boiler 4
001 040	boiler 5
001 050	cooling towers

Table 2: Design data of the tanks and cooling towers

	Kind/Type	Capacity	Unit of Capacity
tank 1	fixed-roof	1400.10^3	litre (code-no. 4)
tank 2	fixed-roof	1400.10^3	litre
tank 3	fixed-roof	1400.10^3	litre
cooling tower 1	sewage cooler with forced ventilation	90.10^6	kcal/h (code-no. 1)
cooling tower 2	sewage cooler with forced ventilation	90.10^6	kcal/h

Table 3: Technical data of the sources

No.	Kind	Dimension				Description
		Height m	Cross section m^2	Length m	Width m	
1	stack with free discharge	100	7,55	-	-	boilers 1, 2, 3
2	stack with free discharge	80	4,91	-	-	boiler 4
3	stack with free discharge	100	7,55	-	-	boiler 5
4	outlet without free discharge	12	-	-	-	tank
5	outlet with free discharge	35	450	24	24	cooling tower 1
6	outlet with free discharge	35	450	24	24	cooling tower 2

1	2	3	4	5	6	7	8	9	10
Kartenart	Vorgang	Betreiber Nr.	Stand-ort Nr.	Branche	Name, Firmenbezeichnung	Postleit-zahl	Wohnort, Betriebsort	Straße, Hausnummer	Telefon-Nr. (Ortsnetz)
1 3	4	5 9	10 12	13 14	15 34	35 38	39 54	55 74	75 80
5 0 0	0	299	000	33	PETROL GMBH	2000	HAMBURG	ALSTER-UFER 117-119	735811
	0	299	001	33	PETROL GMBH/WERK II	5000	KOELN	RHEIN-STRASSE	382783

Erfassungsbeleg B, Betreiberdaten ausgestellt am von

Fig. 2: Completed coding form for the operator data file

3/104 7.72

When grouping the whole plant the power station got the plant code number 001 with the aggregate code number 000 defining the whole power plant.

The numbering of the aggregates follows the idea that every plant part or section of process has its own emission dependence being independent from other plant parts and is recognized as an individual aggregate. Additionally, boilers 1 and 2 are handled as individual aggregates (Nos. 11 und 12). This is necessary for associating accidental releases of the different boilers as well as for describing the technical data.

The 3-digit code numbers of plants and aggregates allow a hierarchical structure; the hundreds places and decimal places are reserved for larger units and the unit places e. g. for detailed allocations.

The coordinates of the plant parts can be taken from the site plan (Fig. 1). The code numbers of kind and type as well as of substances handled and their usage are contained in catalogues. For example the meaning is as follows:

- kind/type code number

0402	boiler cooling with forced ventilation
1200	steam, hot water and warm water boiler heaters
1206	boiler heater with mechanical grate
1207	dust heater with dry ash removal
6213	tank with fixed roof for liquid or gaseous substances

- use code number

0	input substance = product
5	fuel

- unit code number

1	kcal/h
4	liter

The substance names and their code numbers are given in the coding forms as outlined in chap. 2.4.

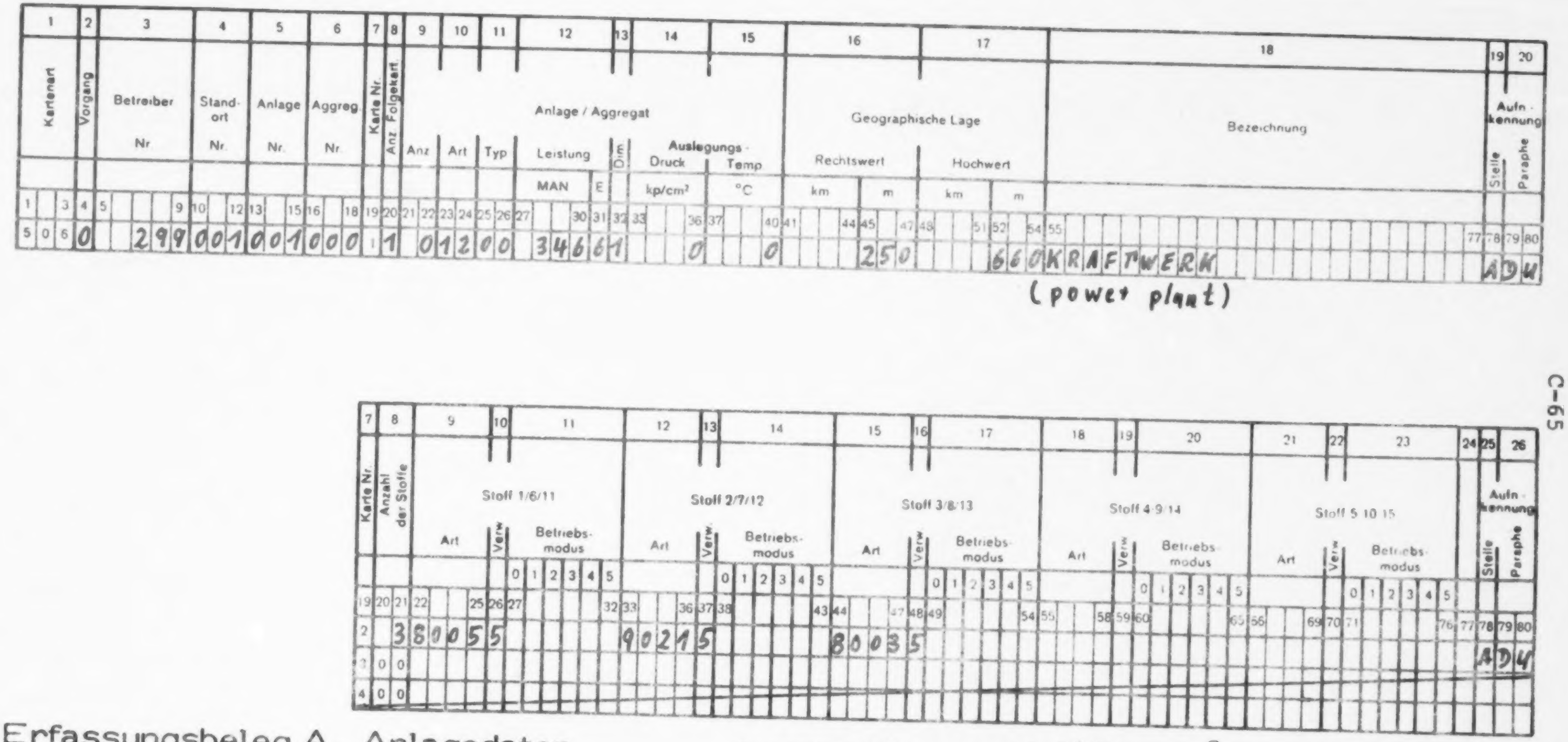
Detailled coding forms for the plant data file as well as computer outputs are given in Figs. 3 to 13.

Fig. 12 is a display of the plant data file as the data are introduced via the collecting forms. Fig. 13 displays the corresponding data output, being produced in an easily legible manner by using texts instead of coding numbers and by restricting to the most important data. So,

- capacity and its dimension
- substances handled and
- usage

are given as texts. The capacity is to be read as follows:

40 + 6 KCL/H = 40 . 10^6 kcal/h



1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber	Standort	Anlage	Aggreg.	Karte Nr.	Anz. Folgekart.	Anlage / Aggregat								Geographische Lage				Bezeichnung	Aufn.-kennung	
		Nr	Nr.	Nr.	Nr.			Anz	Art	Typ	Leistung		Dim	Auslegungs- Druck	Auslegungs- Temp	Rechtswert		Hochwert			Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1–3	4	5–9	10–12	13–15	16–18	19	20	21–22	23–24	25–26	27–30	31	32	33–36	37–40	41–44	45–47	48–51	52–54	55–77	78	79–80
506	0	299	001	001	000	1	1	0	12	00	346	6	1	0	0		250		660	KRAFTWERK	A	DU

(power plant)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11			Stoff 2/7/12			Stoff 3/8/13			Stoff 4/9/14			Stoff 5/10/15				Aufn.-kennung	
		Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus		Stelle	Paraphe
				0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			
19	20–21	22–25	26	27–32	33–36	37	38–43	44–47	48	49–54	55–58	59	60–65	66–69	70	71–76	77	78	79–80
2	3	8005	5		9021	5		8003	5									A	DU
3	00																		
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 3: Completed coding form for the plant data file

1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber	Standort	Anlage	Aggreg.	Karte Nr.	Anz. Folgekart	Anlage / Aggregat								Geographische Lage				Bezeichnung	Aufn.-kennung	
		Nr.	Nr.	Nr.	Nr.			Anz	Art	Typ	Leistung		Dim.	Auslegungs- Druck	Temp.	Rechtswert		Hochwert			Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1 3	4	5 9	10 12	13 15	16 18	19	20	21 22	23 24	25 26	27 30	31	32	33 36	37 40	41 44	45 47	48 51	52 54	55 77	78	79 80
5 0 6	0	2 9 9	0 0 1	0 0 1	0 1 0	1	1	2	1 2	0 6	4 0	6	1	4 3	4 5 0		2 2 8		6 7 3	KESSEL 1+2 (2354+2355)	A	D U

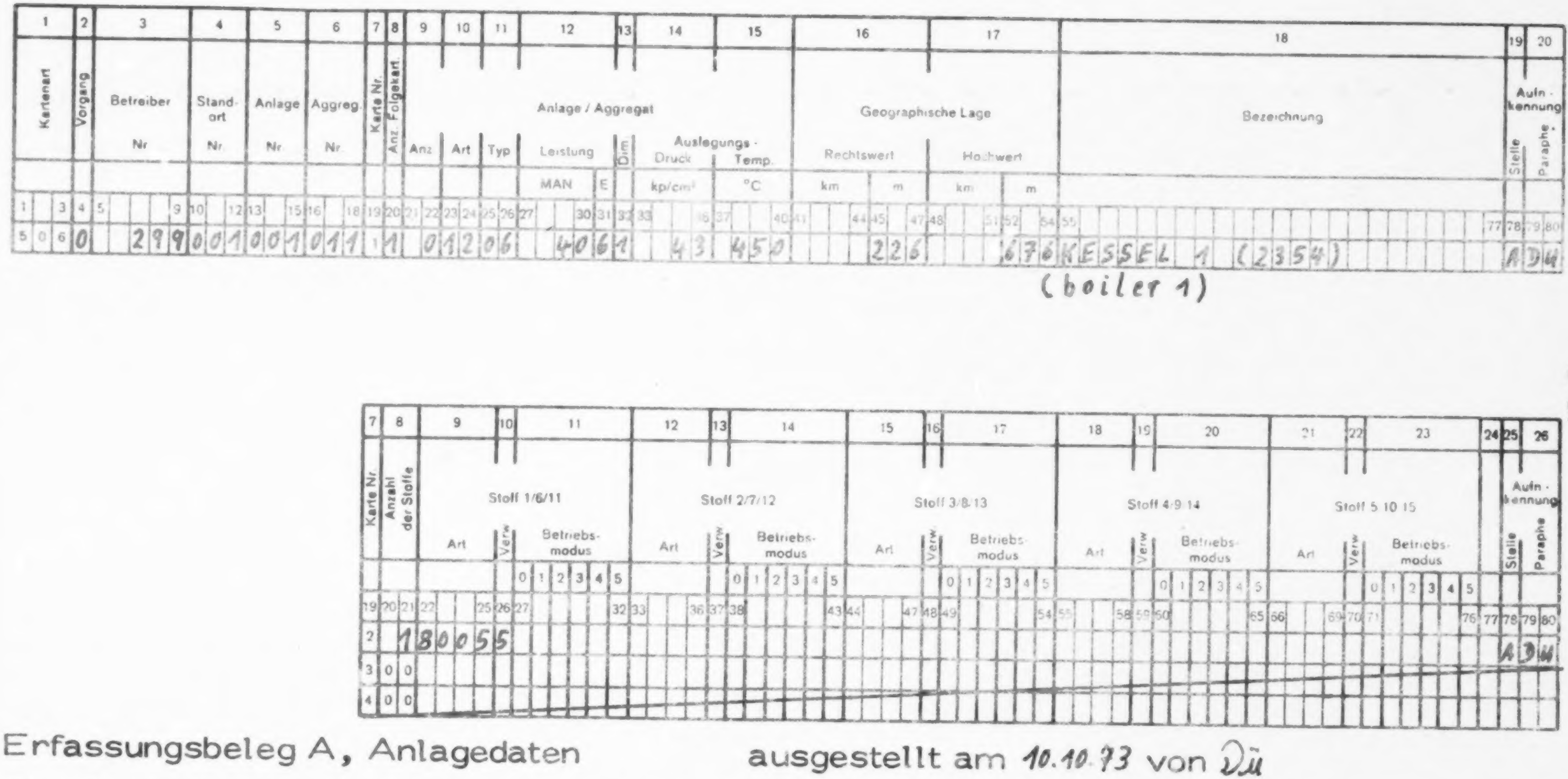
(boilers 1+2)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11			Stoff 2/7/12			Stoff 3/8/13			Stoff 4/9/14			Stoff 5/10/15				Aufn.-kennung	
		Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus		Stelle	Paraphe
				0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			
19	20 21	22 25	26	27 32	33 36	37	38 43	44 47	48	49 54	55 58	59	60 65	56 69	70	71 76	77	78	79 80
2	1	8 0 0 5	5															A	D U
3	0 0																		
4	0 0																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 4: Completed coding form for the plant data file

3/108 11.73



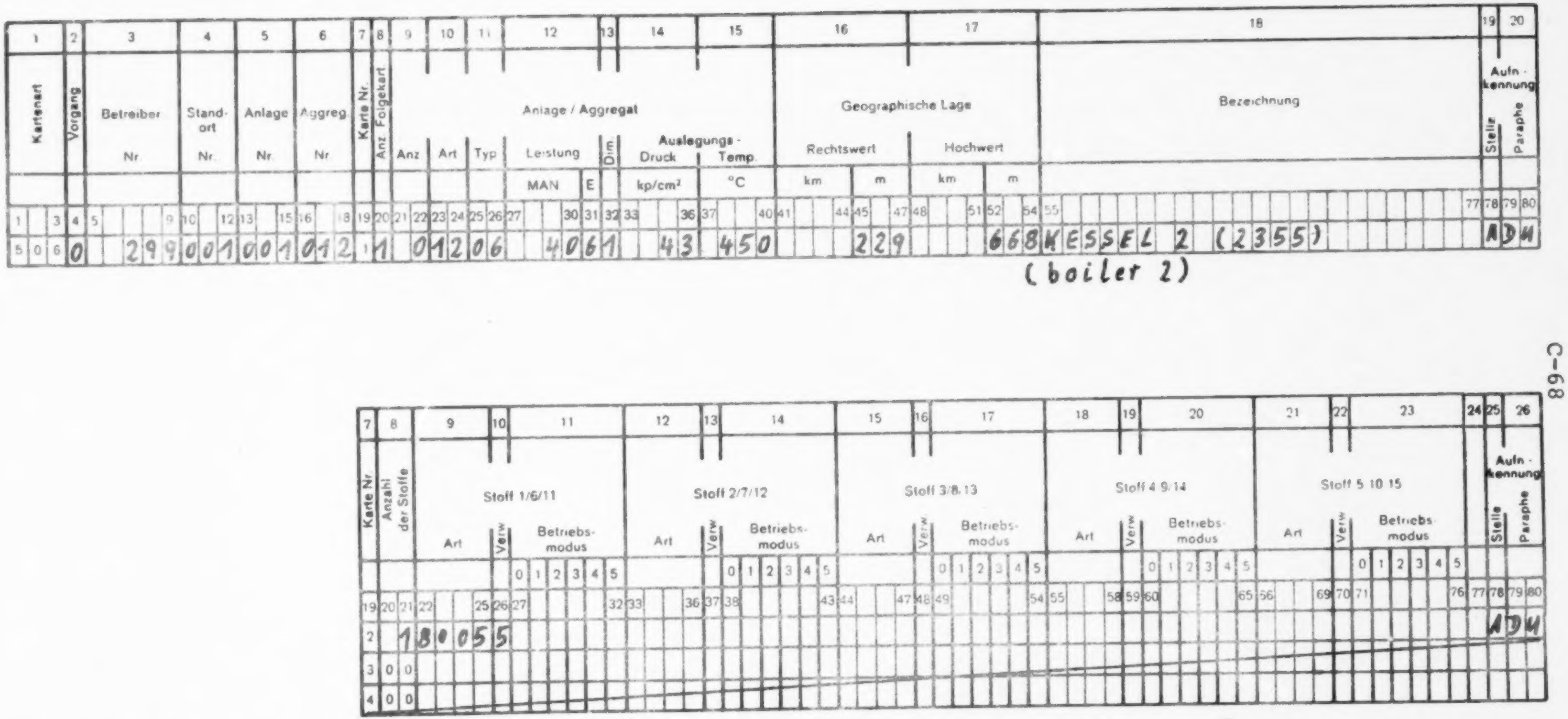
1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber Nr	Stand-ort Nr.	Anlage Nr.	Aggreg. Nr.	Karte Nr.	Anz. Folgekart.	Anlage / Aggregat Anz	Art	Typ	Leistung		Dim	Auslegungs- Druck	Temp.	Geographische Lage Rechtswert		Hochwert		Bezeichnung	Aufn.-kennung Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1 3	4	5 9	10 12	13 15	16 18	19	20	21 22	23 24	25 26	27 30	31	32	33 36	37 40	41 44	45 47	48 51	52 54	55 77	78	79 80
5 0 6	0	2 9 9	0 0 1	0 0 1	0 1 1	1	1	0	1 2	0 6	4 0	6	1	4 3	4 5 0		2 2 6		6 7 6	KESSEL 1 (2354)	A	Dü

(boiler 1)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11 Art	Verw	Betriebs-modus	Stoff 2/7/12 Art	Verw	Betriebs-modus	Stoff 3/8/13 Art	Verw	Betriebs-modus	Stoff 4/9/14 Art	Verw	Betriebs-modus	Stoff 5/10/15 Art	Verw	Betriebs-modus		Aufn.-kennung Stelle	Paraphe
				0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			
19	20 21	22 25	26	27 32	33 36	37	38 43	44 47	48	49 54	55 58	59	60 65	66 69	70	71 76	77	78	79 80
2	1	8 0 0 5	5															A	Dü
3	0 0																		
4	0 0																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 5: Completed coding form for the plant data file



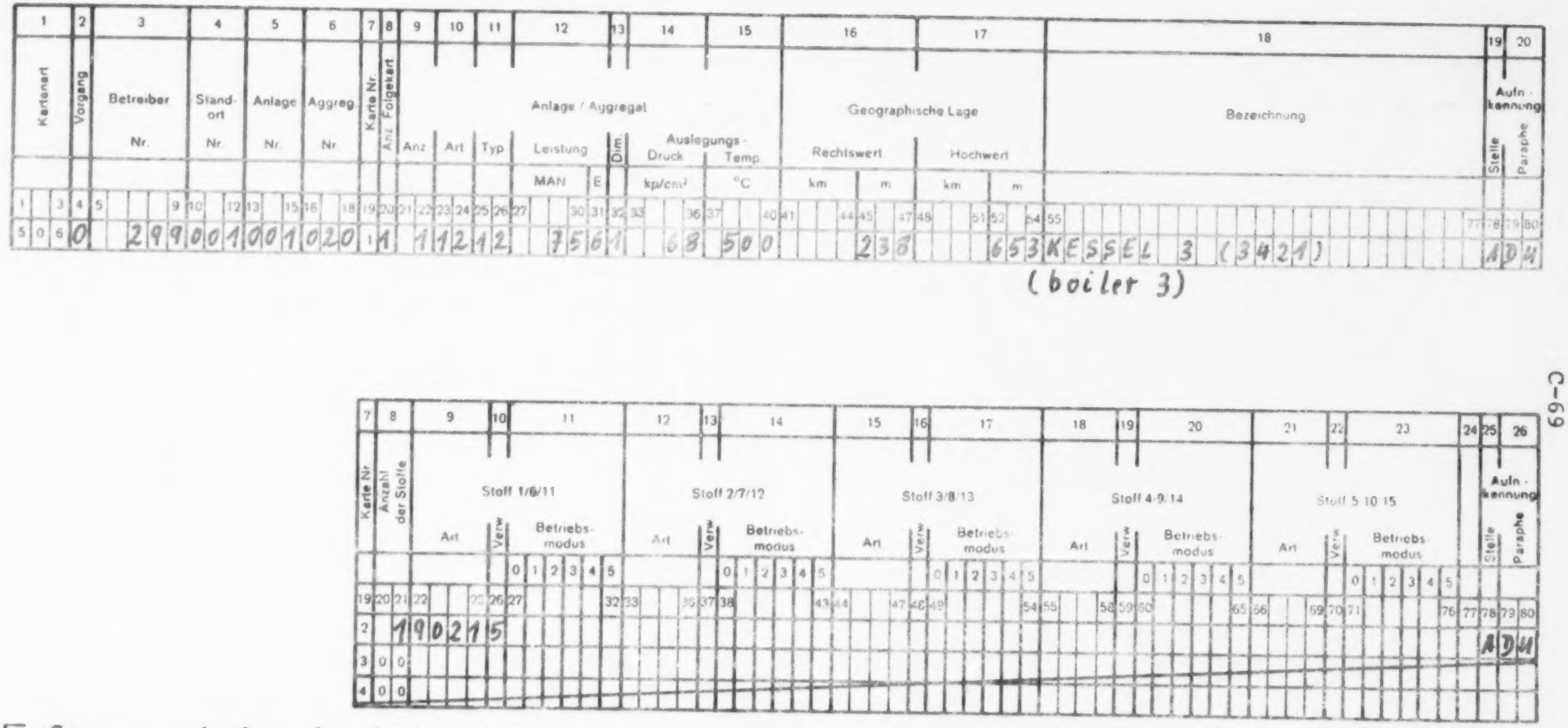
1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber Nr.	Stand-ort Nr.	Anlage Nr.	Aggreg. Nr.	Karte Nr.	Anz. Folgekart	Anlage / Aggregat Anz	Art	Typ	Leistung		Dim.	Auslegungs- Druck	Temp.	Geographische Lage Rechtswert		Hochwert		Bezeichnung	Aufn.-kennung Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1–3	4	5–9	10–12	13–15	16–18	19	20	21–22	23–24	25–26	27–30	31	32	33–36	37–40	41–44	45–47	48–51	52–54	55–77	78	79–80
506	0	299	001	001	012	1	1	0	12	06	40	6	1	43	450		229		668	KESSEL 2 (2355)	A	DM

(boiler 2)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11 Art	Verw	Betriebsmodus	Stoff 2/7/12 Art	Verw	Betriebsmodus	Stoff 3/8/13 Art	Verw	Betriebsmodus	Stoff 4/9/14 Art	Verw	Betriebsmodus	Stoff 5/10/15 Art	Verw	Betriebsmodus		Aufn.-kennung Stelle	Paraphe
				0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			
19	20–21	22–25	26	27–32	33–36	37	38–43	44–47	48	49–54	55–58	59	60–65	66–69	70	71–76	77	78	79–80
2	1	8005	5															A	DM
3	00																		
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 6: Completed coding form for the plant data file



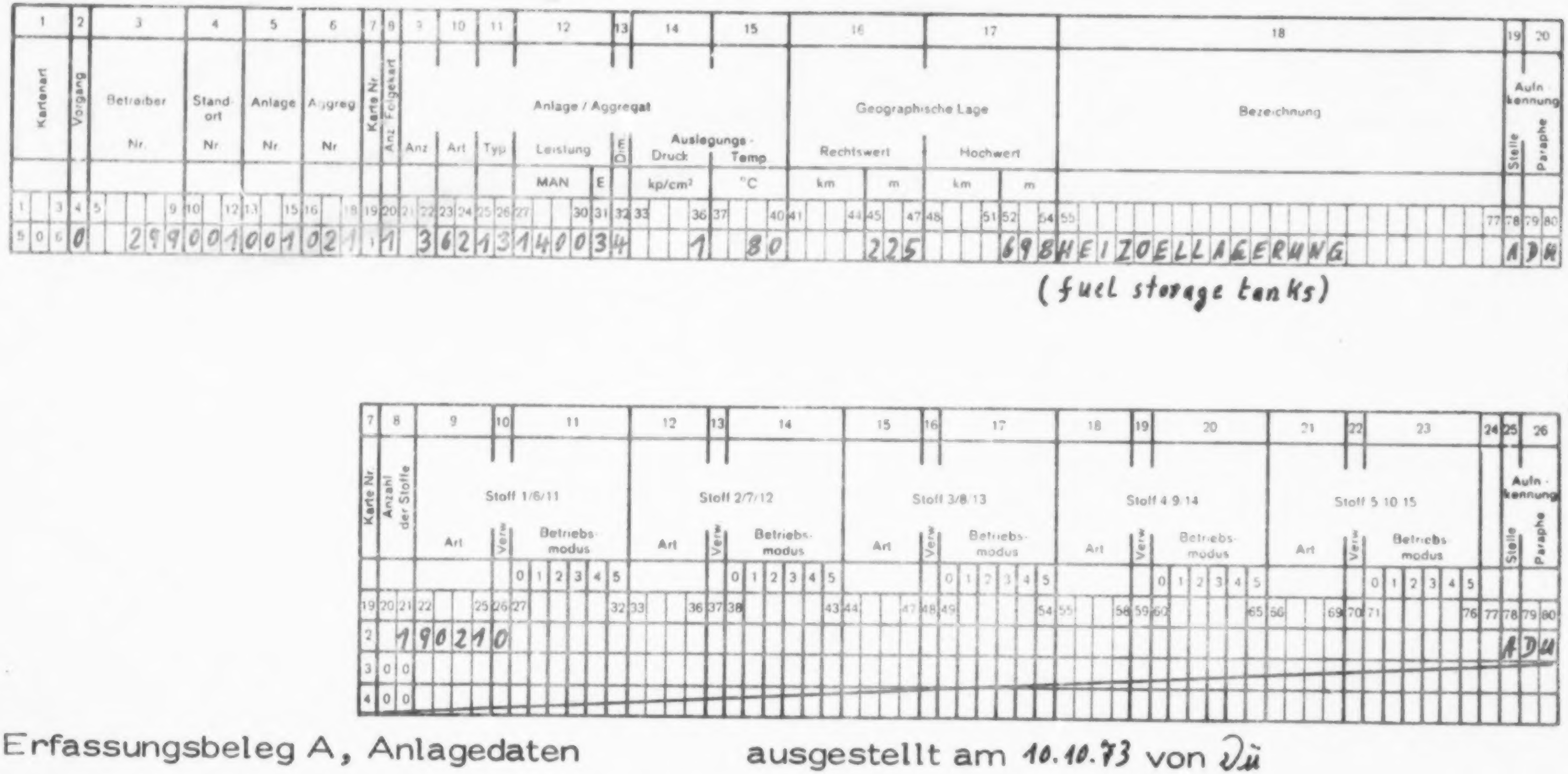
1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber Nr.	Stand-ort Nr.	Anlage Nr.	Aggreg. Nr	Karte Nr.	Anz. Folgekart.	Anlage / Aggregat Anz	Art	Typ	Leistung		Dim.	Auslegungs- Druck	Auslegungs- Temp	Geographische Lage Rechtswert		Hochwert		Bezeichnung	Aufn.-kennung Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1–3	4	5–9	10–12	13–15	16–18	19	20	21–22	23–24	25–26	27–30	31	32	33–36	37–40	41–44	45–47	48–51	52–54	55–77	78	79–80
506	0	299	001	001	020	1	1	1	12	12	756	1		68	500		238		653	KESSEL 3 (3421)	A	DU

(boiler 3)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11 Art	Verw	Betriebs-modus	Stoff 2/7/12 Art	Verw	Betriebs-modus	Stoff 3/8/13 Art	Verw	Betriebs-modus	Stoff 4/9/14 Art	Verw	Betriebs-modus	Stoff 5/10/15 Art	Verw	Betriebs-modus		Aufn.-kennung Stelle	Paraphe
				0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			
19	20–21	22–25	26	27–32	33–36	37	38–43	44–47	48	49–54	55–58	59	60–65	66–69	70	71–76	77	78	79–80
2	1	9021	5															A	DU
3	00																		
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 7: Completed coding form for the plant data file



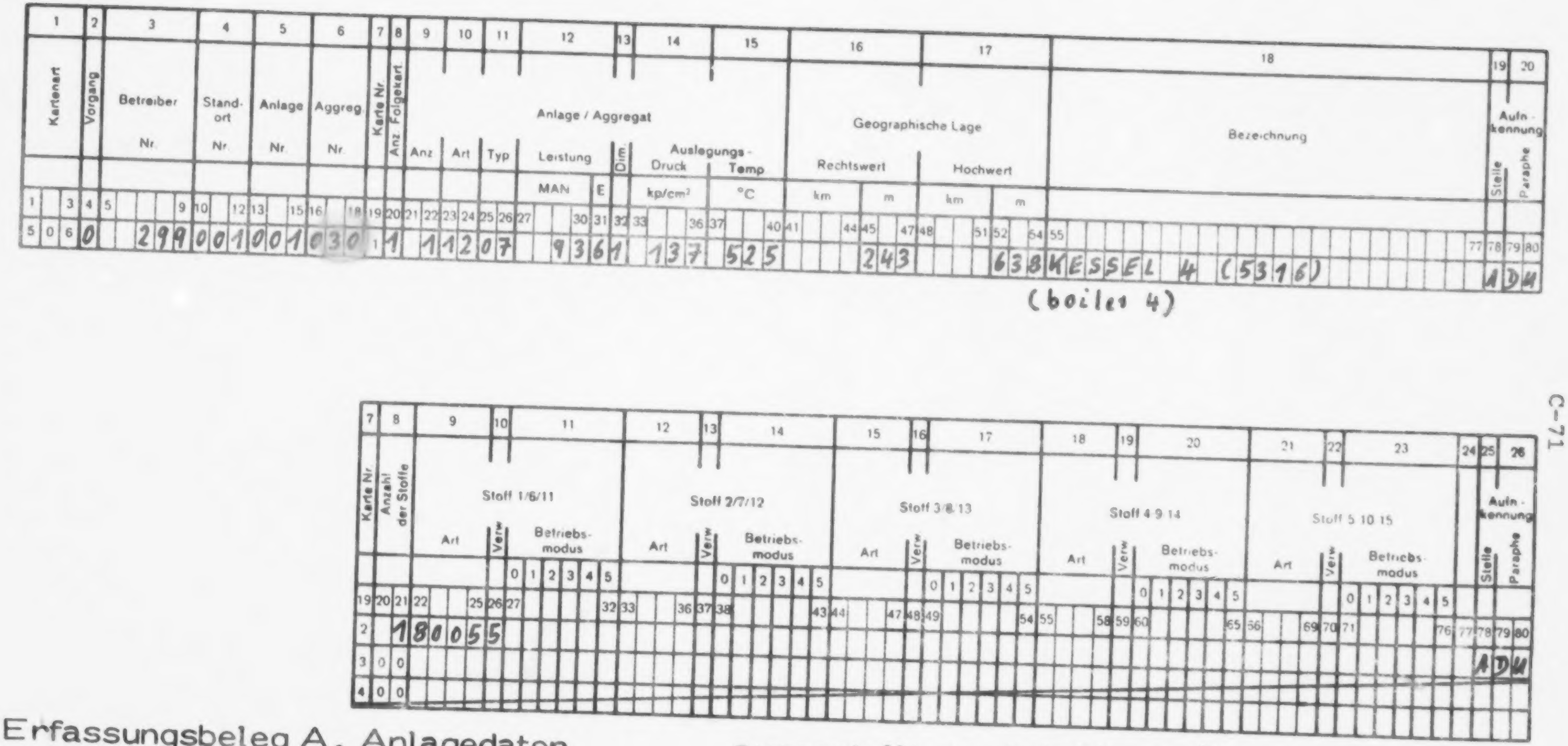
1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber	Standort	Anlage	Aggreg	Karte Nr	Anz Folgekart	Anlage / Aggregat								Geographische Lage				Bezeichnung	Aufn.kennung	
		Nr.	Nr	Nr	Nr			Anz	Art	Typ	Leistung		Dim	Auslegungs- Druck	Auslegungs- Temp	Rechtswert		Hochwert			Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1–3	4	5–9	10–12	13–15	16–18	19	20	21–22	23–24	25–26	27–30	31	32	33–36	37–40	41–44	45–47	48–51	52–54	55–77	78	79–80
506	0	299	001	001	021	1	1	3	62	13	1400	3	4	1	80		225		698	HEIZOELLAGERUNG	A	Dü

(fuel storage tanks)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr	Anzahl der Stoffe	Stoff 1/6/11			Stoff 2/7/12			Stoff 3/8/13			Stoff 4/9/14			Stoff 5/10/15				Aufn.kennung	
		Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus		Stelle	Paraphe
				0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			
19	20–21	22–25	26	27–32	33–36	37	38–43	44–47	48	49–54	55–58	59	60–65	66–69	70	71–76	77	78	79–80
2	1	9021	0															A	Dü
3	00																		
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 8: Completed coding form for the plant data file



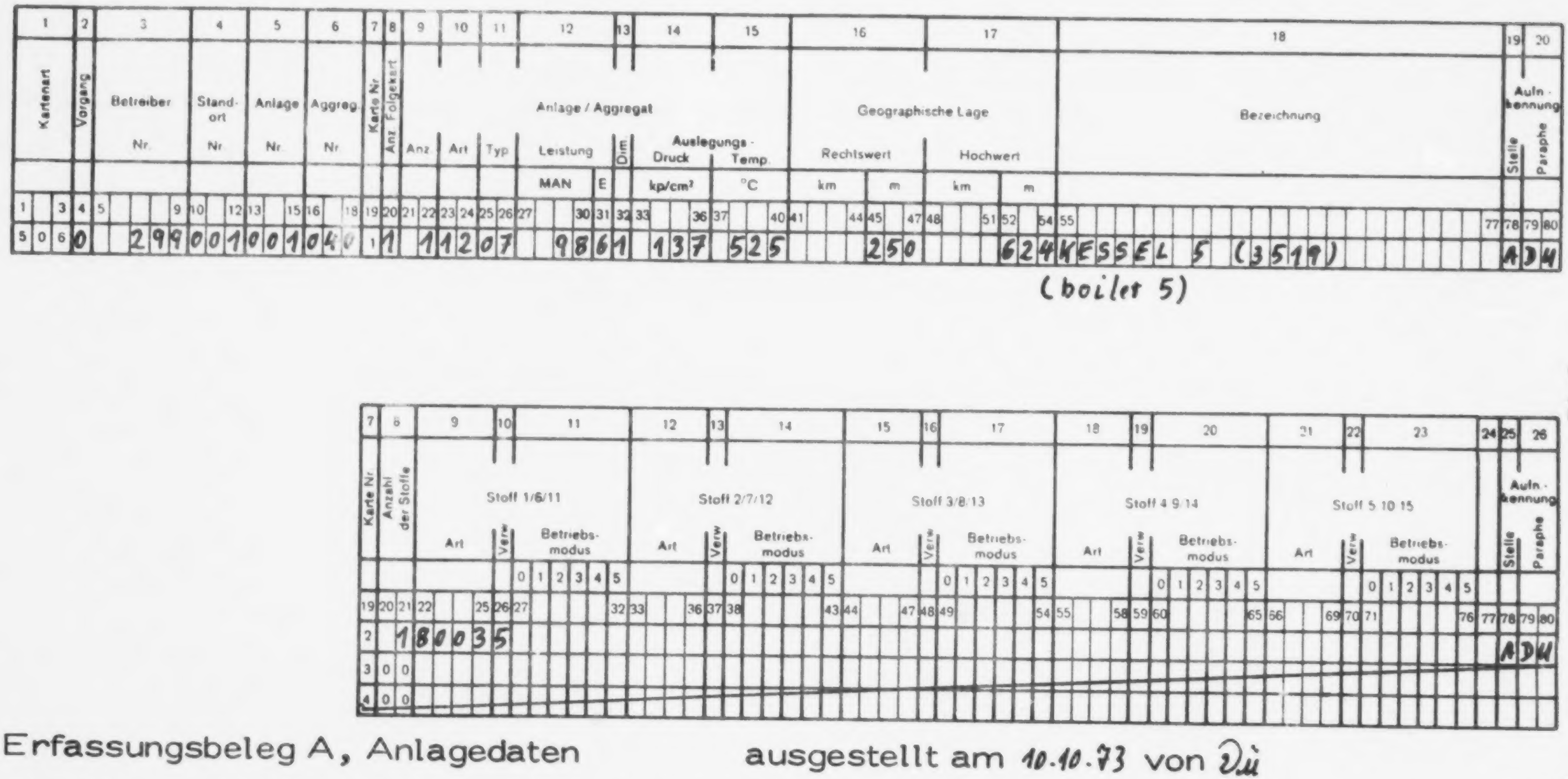
1	2	3	4	5	6	7	8	9	10	11	12	12	13	14	15	16	16	17	17	18	19	20
Kartenart	Vorgang	Betreiber Nr.	Stand-ort Nr.	Anlage Nr.	Aggreg. Nr.	Karte Nr.	Anz. Folgekart	Anlage / Aggregat Anz	Anlage / Aggregat Art	Anlage / Aggregat Typ	Leistung MAN	Leistung E	Dim.	Auslegungs-Druck kp/cm²	Auslegungs-Temp °C	Geographische Lage Rechtswert km	Geographische Lage Rechtswert m	Geographische Lage Hochwert km	Geographische Lage Hochwert m	Bezeichnung	Aufn.-kennung Stelle	Aufn.-kennung Paraphe
1–3	4	5–9	10–12	13–15	16–18	19	20	21–22	23–24	25–26	27–30	31	32	33–36	37–40	41–44	45–47	48–51	52–54	55–77	78	79–80
506	0	299	001	001	030	1	1	1	12	07	93	6	1	137	525		243		638	KESSEL 4 (5316)	A	DU

(boiler 4)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11 Art	Stoff 1/6/11 Verw	Stoff 1/6/11 Betriebs-modus 0 1 2 3 4 5	Stoff 2/7/12 Art	Stoff 2/7/12 Verw	Stoff 2/7/12 Betriebs-modus 0 1 2 3 4 5	Stoff 3/8/13 Art	Stoff 3/8/13 Verw	Stoff 3/8/13 Betriebs-modus 0 1 2 3 4 5	Stoff 4/9/14 Art	Stoff 4/9/14 Verw	Stoff 4/9/14 Betriebs-modus 0 1 2 3 4 5	Stoff 5/10/15 Art	Stoff 5/10/15 Verw	Stoff 5/10/15 Betriebs-modus 0 1 2 3 4 5		Aufn.-kennung Stelle	Aufn.-kennung Paraphe
19	20–21	22–25	26	27–32	33–36	37	38–43	44–47	48	49–54	55–58	59	60–65	66–69	70	71–76	77	78	79–80
2	1	8005	5																
3	00																		A	DU
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 9: Completed coding form for the plant data file



1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber	Standort	Anlage	Aggreg.	Karte Nr	Anz Folgekart	Anlage / Aggregat								Geographische Lage				Bezeichnung	Aufn.-kennung	
		Nr.	Nr	Nr.	Nr			Anz	Art	Typ	Leistung		Dim	Auslegungs- Druck	Auslegungs- Temp.	Rechtswert		Hochwert			Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1 3	4	5 9	10 12	13 15	16 18	19	20	21 22	23 24	25 26	27 30	31	32	33 36	37 40	41 44	45 47	48 51	52 54	55 77	78	79 80
506	0	299	001	001	040	1	1	1	12	07	98	6	1	137	525		250		624	KESSEL 5 (3519)	A	DH

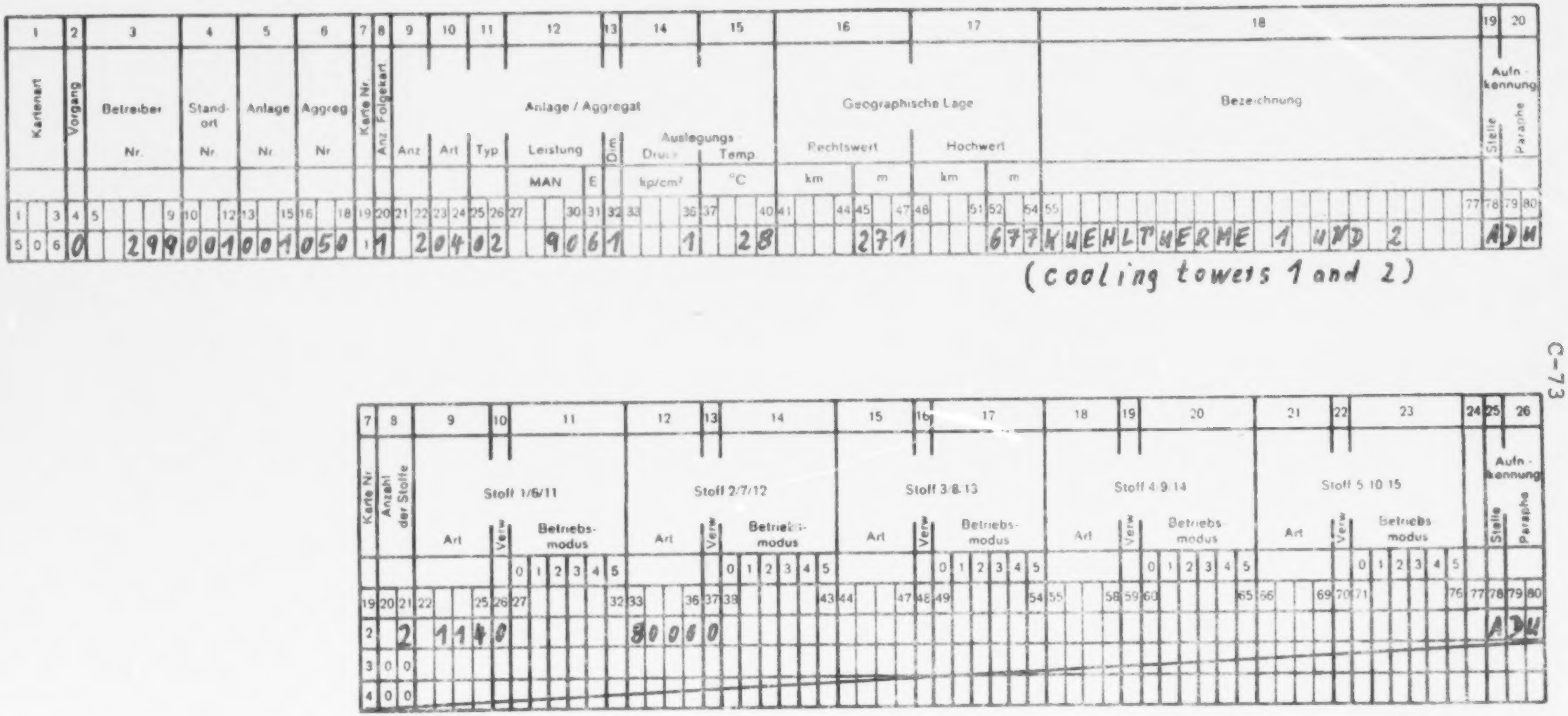
(boiler 5)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr	Anzahl der Stoffe	Stoff 1/6/11			Stoff 2/7/12			Stoff 3/8/13			Stoff 4/9/14			Stoff 5/10/15				Aufn.-kennung	
		Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus	Art	Verw	Betriebsmodus		Stelle	Paraphe
				0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			0 1 2 3 4 5			
19	20 21	22 25	26	27 32	33 36	37	38 43	44 47	48	49 54	55 58	59	60 65	66 69	70	71 76	77	78	79 80
2	1	8003	5															A	DH
3	00																		
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 10: Completed coding form for the plant data file

3/108 11.73



1	2	3	4	5	6	7	8	9	10	11	12	12	13	14	15	16	16	17	17	18	19	20
Kartenart	Vorgang	Betreiber Nr.	Standort Nr.	Anlage Nr.	Aggreg Nr.	Karte Nr.	Anz Folgekart	Anlage / Aggregat Anz	Art	Typ	Leistung MAN	E	Dim	Auslegungs- Druck kp/cm²	Auslegungs- Temp °C	Geographische Lage Rechtswert km	m	Hochwert km	m	Bezeichnung	Aufn.-kennung Stelle	Paraphe
1–3	4	5–9	10–12	13–15	16–18	19	20	21–22	23–24	25–26	27–30	31	32	33–36	37–40	41–44	45–47	48–51	52–54	55–77	78	79–80
506	0	299	001	001	050	1	1	2	04	02	90	6	1	1	28		271		677	KUEHLTUERME 1 UND 2	A	DU

(cooling towers 1 and 2)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11 Art	Verw	Betriebsmodus 0 1 2 3 4 5	Stoff 2/7/12 Art	Verw	Betriebsmodus 0 1 2 3 4 5	Stoff 3/8/13 Art	Verw	Betriebsmodus 0 1 2 3 4 5	Stoff 4/9/14 Art	Verw	Betriebsmodus 0 1 2 3 4 5	Stoff 5/10/15 Art	Verw	Betriebsmodus 0 1 2 3 4 5		Aufn.-kennung Stelle	Paraphe
19	20–21	22–25	26	27–32	33–36	37	38–43	44–47	48	49–54	55–58	59	60–65	66–69	70	71–76	77	78	79–80
2	2	114	0		8006	0												A	DU
3	00																		
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 10.10.73 von Dü

Fig. 11: Completed coding form for the plant data file

3/108 11.73

```
BETR/ORT ANLAGG A N L A G E/A G G R E G .  GEOGRAPH. LAGE   B E Z E I C H N U N G AUF GEHANDHABTE STOFFE
                ZA ARTY LEIST D DRUK TEMP RECHTSW HOCHWRT                          IPS ANZ   NR V MODUS   NR V MODUS   NR V MODUS
                        MAN E

299001   1000  0 1200  3466 1    0    0    250    660 KRAFTWERK                   ADU    3 8005 5000000 9021 5000000 8003 5000000
299001   1010  2 1206   906 1   43  950    228    673 KESSEL 1+2 (2354+2355)      ADU    1 8005 5000000    0          0    0       0
299001   1011  0 1206   906 1   43  960    226    676 KESSEL 1 (2354)             ADU    1 8005 5000000    0          0    0       0
299001   1012  0 1206   906 1   43  950    229    668 KESSEL 2 (2355)             ADU    1 8005 5000000    0          0    0       0
299001   1020  1 1212   756 1   68  500    230    653 KESSEL 3 (3921)             ADU    1 9021 5000000    0          0    0       0
299001   1021  3 6213 19003 9    1   80    225    698 HEIZOELLAGERUNG             ADU    1 9021       0    0          0    0       0
299001   1030  1 1207   936 1  137  525    243    638 KESSEL 4 (5316)             ADU    1 8005 5000000    0          0    0       0
299001   1040  1 1207   986 1  137  525    250    629 KESSEL 5 (3619)             ADU    1 8003 5000000    0          0    0       0
299001   1080  2  402   906 1    1   28    271    677 KUEHLTUERME 1 UND 2         ADU    2  119       0 8000          0    0       0
```

Fig. 12: Printout of the plant data file for the power plant

```
BETREIBER-NR.   299   STANDORT   1

ANL AGG  B E Z E I C H N U N G  ANLAGE / AGGREGAT                          GEHANDHABTE STOFFE
                                ZA ARTY  LEISTUNG  (DIM) DRUCK TEMP NR   BEZEICHNUNG                         VERWENDUNG   MODUS

  1    0 KRAFTWERK               0 1200     346+6  KCL/H     0    0 8005 STEINKOHLE                          BRENNSTOFF       0
                                                                    9021 HEIZOEL S (EA)                      BRENNSTOFF       0
                                                                    8003 RHEIN.ROHBRAUNKOHLE                 BRENNSTOFF       0
  1   10 KESSEL 1+2 (2354+2355)  2 1206      90+6  KCL/H    92  950 8005 STEINKOHLE                          BRENNSTOFF       0
  1   11 KESSEL 1 (2354)         0  206      90+6  KCL/H    93  950 8005 STEINKOHLE                          BRENNSTOFF       0
  1   12 KESSEL 2 (2355)         0 1206      90+6  KCL/H    93  950 8005 STEINKOHLE                          BRENNSTOFF       0
  1   20 KESSEL 3 (3921)         1 1212      75+6  KCL/H    68  500 9021 HEIZOEL S (EA)                      BRENNSTOFF       0
  1   21 HEIZOELLAGERUNG         3 6213    1900+3  LITER     1   80 9021 HEIZOEL S (EA)                      EINSZ-PRDK       0
  1   30 KESSEL 4 (5316)         1 1207      93+6  KCL/H   137  525 8005 STEINKOHLE                          BRENNSTOFF       0
  1   40 KESSEL 5 (3619>         1 1207      98+6  KCL/H   137  525 8003 RHEIN.ROHBRAUNKOHLE                 BRENNSTOFF       0
  1   80 KUEHLTUERME 1 UND 2     2  402      90+6  KCL/H     1   28  119 WASSER                              EINSZ-PRDK       0
                                                                    8000 LUFT                                EINSZ-PRDK       0
```

Fig. 13: Text printout of the plant data file for the power plant

2.2 Assembling the source data file

All data except the coordinates which can be taken from the site plan are included in Table 3. The numbering is consecutively. The code number of the kind of installation can be taken from addendum I, 1 and are as follows:

-	sources 1 to 3	stack of bricks with free exhaust stream: code No. 10
-	source 4	flame trap: code No. 19
-	sources 5 and 6	outlet of the cooling towers: code No. 10.

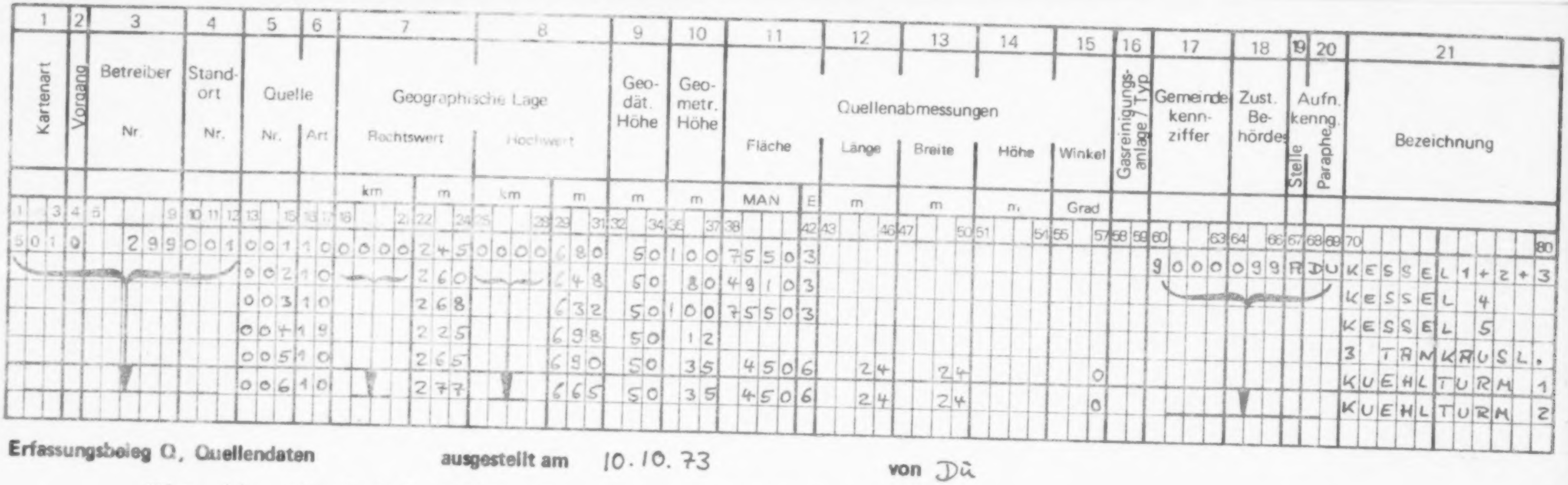
Information concerning gas cleaning units (position 16) are only introduced if not attainable to a certain emissions process (refer to assembling emission data, coding form E).

The completed forms are displayed in Fig. 14 and Fig. 15 shows the corresponding computer printout.

2.3 Assembling emissions data file

2.3.1 Potential causes of emissions

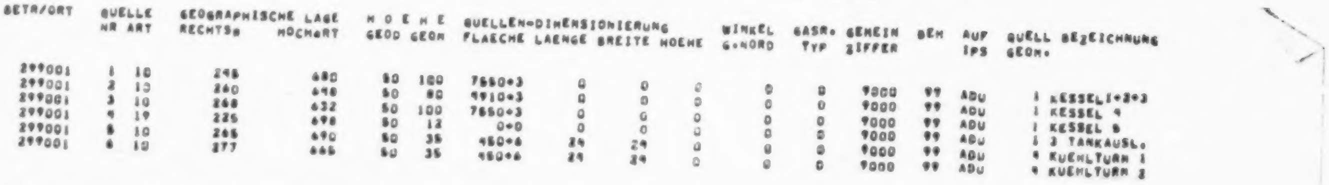
Components of the power plant from which emissions can be registered, apart from the furnace, are the coal storage area, the fuel oil pools and the cooling towers. All other components of the plant e. g. the steam turbines, generators and transformers are not relevant to the question of clean air pollution and are subsequently not dealt with in the emission report.



1	2	3	4	5	6	7		8		9	10	11		12	13	14	15	16	17	18	19	20	21
Kartenart	Vorgang	Betreiber	Standort	Quelle		Geographische Lage				Geodät. Höhe	Geometr. Höhe	Quellenabmessungen						Gasreinigungsanlage / Typ	Gemeindekennziffer	Zust. Behördes	Aufn. kenng.		Bezeichnung
		Nr.	Nr.	Nr.	Art	Rechtswert		Hochwert				Fläche		Länge	Breite	Höhe	Winkel				Stelle	Paraphe	
						km	m	km	m	m	m	MAN	E	m	m	m	Grad						
1 3	4	5 9	10 11 12	13 15	16 17	18 21	22 24	25 28	29 31	32 34	36 37	38	42	43 46	47 50	51 54	55 57	58 59	60 63	64 66	67	68 69	70 80
501	0	299	001	001	10	0000	245	0000	680	50	100	7550	3						9000	099	R	DU	KESSEL 1+2+3
				002	10		260		648	50	80	4910	3										KESSEL 4
				003	10		268		632	50	100	7550	3										KESSEL 5
				004	19		225		698	50	12												3 TANKAUSL.
				005	10		265		690	50	35	450	6	24	24		0						KUEHLTURM 1
				006	10		277		665	50	35	450	6	24	24		0						KUEHLTURM 2

Erfassungsbeleg Q, Quellendaten **ausgestellt am** 10.10.73 **von** Dü

Fig. 14: Completed coding form for the source data file



```
BETR/ORT  QUELLE  GEOGRAPHISCHE LAGE  H O E H E  QUELLEN-DIMENSIONIERUNG        WINKEL GASR. GEMEIN BEM AUF QUELL BEZEICHNUNG
          NR ART  RECHTSW.   HOCHWRT  GEOD GEOM  FLAECHE LAENGE BREITE HOEHE    G.NORD  TYP  ZIFFER     IPS GEOM.

299001     1  10     245        680    50  100    7550+3     0      0     0        0     0   9000   99  ADU    1 KESSEL1+2+3
299001     2  10     260        648    50   80    4910+3     0      0     0        0     0   9000   99  ADU    1 KESSEL 4
299001     3  10     268        632    50  100    7550+3     0      0     0        0     0   9000   99  ADU    1 KESSEL 5
299001     4  19     225        698    50   12       0+0     0      0     0        0     0   9000   99  ADU    1 3 TANKAUSL.
299001     5  10     265        690    50   35     450+6    24     24     0        0     0   9000   99  ADU    4 KUEHLTURM 1
299001     6  10     277        665    50   35     450+6    24     24     0        0     0   9000   99  ADU    4 KUEHLTURM 2
```

Fig. 15: Printout of the source data file

In the case of the furnaces the combustion process itself and the soot blowing to remove the soot on the heating surfaces of the boiler are causes of emissions. Changes in fuel composition and operating modifications instituted by plant personnel (load fluctuation) in connection with the firing process can be of considerable influence on emission characteristics. Malfunctions arising in the dust collectors will result in an increase in dust-loaden emissions.

Moreover dust emissions can be caused by the loading and transportation of coal and when coal particles and slurry are stirred up from coal deposits.

These emissions, however, in smaller plants are just as unimportant as the evaporation of volatiles from coal. In terms of substances emitted and the result as far as immissions are concerned, such emissions are barely distinguishable from natural emission processes and are therefore not discussed further here. On the other hand emissions from fuel oil storage tanks should always be recorded because although quantitatively small they have a pungent smell. Steam emissions from cooling towers can lead to the formation of haze or fog; otherwise steam leakages from the boilers themselves and from the pipes are negligible.

2.3.2 Emissions of the boilers

2.3.2.1 Normal operation

The proceeding with data acquisition and taking-over the information is to be illustrated by the boilers 1 and 2 in normal operation first. The annual consumption of pit coal is 74.000 t. According to the records of operation, both boilers are run under full load from October up to and including April to cover the increased base load demanded at that time. For the rest of time only one of the boilers is in operation. The fuel consumption B_h (kJ/hr) per hour of a boiler can be calculated from the furnance capacity Q_F (kJ/hr) and from the net calorific value of the coal H_u (kJ/kg). The fuel consumption of the boilers at full capacity is thus:

2 boilers in operation: (October to April)	212 days/year	$B = 54{,}3 \times 10^3$ t/a
1 boiler in operation: (Mai to September)	153 days/year	$B = 19{,}6 \times 10^3$ t/a
Annual fuel consumption:		$B = 73{,}9 \times 10^3$ t/a

The volume of waste gas emitted from a boiler can be calculated from stoichiometric combustion equations or by reference to relevant diagrams e. g. see Boie, here with a mean carbon-dioxide (CO_2) concentration of 8,6 % and a mean waste gas temperature of 463 K it is approximately 98.000 m^3/h (refers to normal condition i. e. 1013 mbar, 273 K).

As emitted substances from bituminous coal furnaces the following individual components are considered:

- sulfur oxide - usually collectively represented as SO_2
- nitrogen oxides - usually collectively represented as NO_2
- carbon monoxide
- fluorines, usually collectively represented as hydrogen fluoride

Additionally

- organic gases with mostly unidentified constituents
- particulate emissions which are as a rule summarily represented.

Water vapor and carbon dioxide emissions from furnaces are usually not taken into account.

If sufficient measuring results are not available to determine the emissions of all components information must be taken from literature very often. Sulfur dioxid and fluoride emissions e. g. are calculated from fuel data.

In the above numerical example, the sulfur content of the bituminous coal was estimated at 1.25 % and the retention in the ash was assumed to be 5 %. The fluor content was estimated at 0.014 % and it will be retained in the ash at 15 %.

For nitrogen oxides Kolar e. g. quotes Woolrich and his concept of an empirical equation for the emission, developed in accordance with the results of an evaluation of numerous measurements of different furnace equipment.

The carbon monoxide emissions and the emissions for organic gases are to be calculated by emission factors in relationship to the furnace capacity:

For coal furnace with a capacity of more than 10.5×10^6 kg/hr

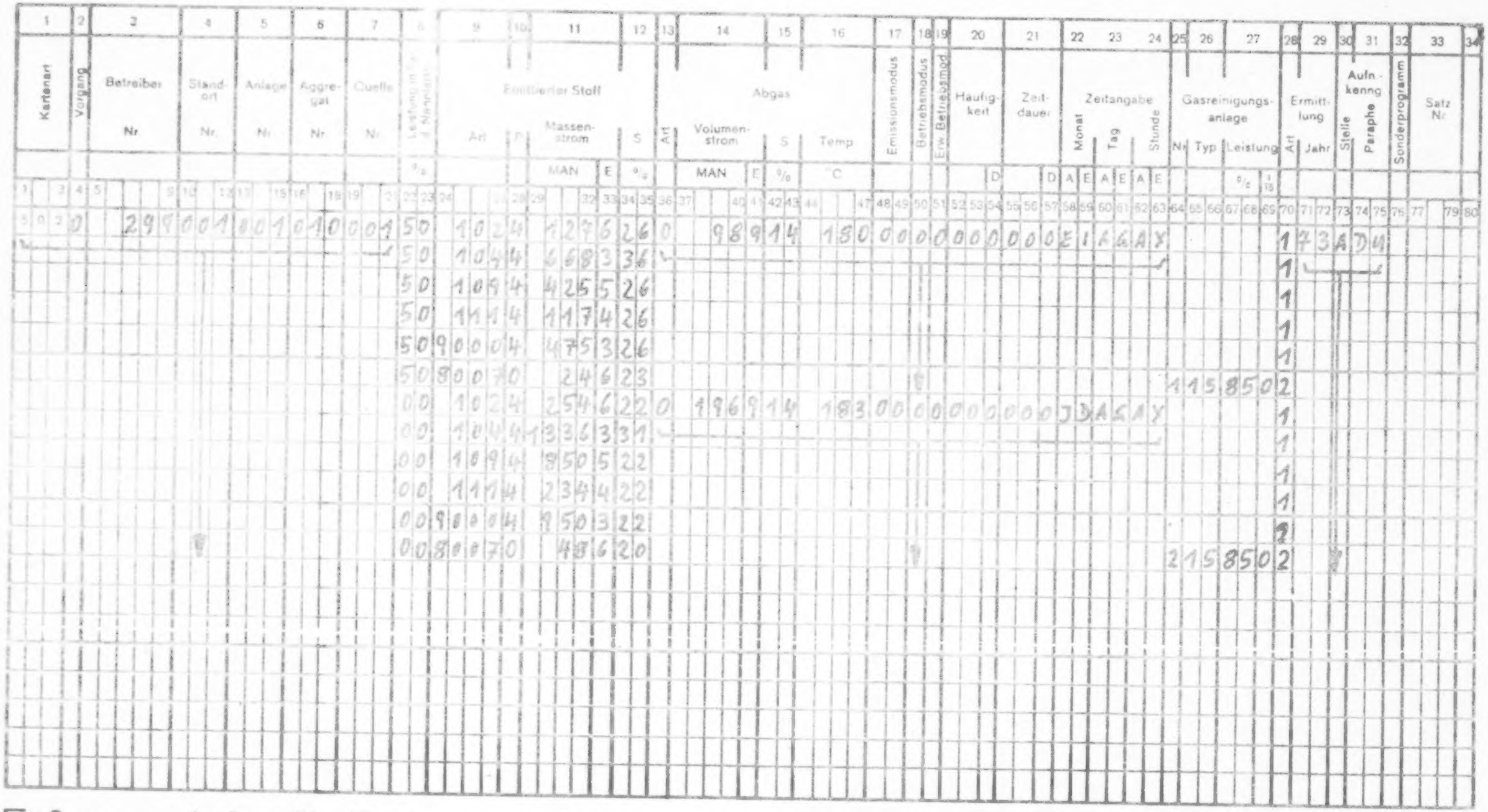
- carbon monoxide	0.220 kg/t coal
- organic gases	0.089 kg/t coal.

As to the dust emissions reference is to be made to measurements taken when the boiler was operating at maximum continuous output. An average dust concentration of 245 mg/m³ was determined. If appropriate measurements are not available or still have to be carried out then relevant literature values may be applied. In many cases use can be made of literature dealing with similar cases and guide values established after making comparative assessments.

The results of emission data collecting for the boilers 1 and 2 are given in Table 4. The basic data already described before are the same for all emitted substances. The filled-in coding form is given in Figure 16. Figure 22 shows the printout of the emission data file and Figs. 23 and 24 an extract of these data.

Table 4: Emissions data for boilers Nos. 1 and 2

		1 boiler in operation	2 boilers in operation
Load range in (Furnace capacity)	%	50	100
Quantity of flue gas (wet) in	m³/hr	98000	196000
Flue gas temperature	K	180	183
SO_2-emissions	kg/hr	127	254
NO_2-emissions	kg/hr	42.5	85.0
CO -emissions	kg/hr	1.17	2.34
F^- -emissions	kg/hr	0.668	1.336
Emissions of organic gases	kg/hr	0.475	0.950
Emissions of fly ash from bituminous firing			
- smaller than 10 µm	kg/hr	18	36
- larger than 10 µm	kg/hr	6	12



1 Kartenart	2 Vorgang	3 Betreiber Nr	4 Standort Nr.	5 Anlage Nr.	6 Aggregat Nr	7 Quelle Nr.	8 Leistung in % d. Nennlast %	9 Emittierter Stoff Art	10 P	11 Massenstrom MAN	11 E	12 S %	13 Art	14 Abgas Volumenstrom MAN	14 E	15 S %	16 Temp °C	17 Emissionsmodus	18 Betriebsmodus	19 Erw. Betriebsmod	20 Häufigkeit D	21 Zeitdauer D	22 Zeitangabe Monat A	22 Monat E	23 Tag A	23 Tag E	24 Stunde A	24 Stunde E	25 Gasreinigungsanlage Nr	26 Typ	27 Leistung %	27 1/10	28 Ermittlung Art	29 Jahr	30 Aufn.-kenng Stelle	31 Paraphe	32 Sonderprogramm	33 Satz Nr	34
1–3	4	5–9	10–12	13–15	16–18	19–21	22–23	24–27	28	29–32	33	34–35	36	37–40	41	42–43	44–47	48–49	50	51	52–54	55–57	58	59	60	61	62	63	64	65–66	67–68	69	70	71–72	73	74–75	76	77–79	80
302	0	299	001	001	010	001	50	102	4	127	6	26	0	98	9	14	180	00	0	0	000	000	E	I	A	G	A	Y					1	73	A	DU			
							50	104	4	668	3	36																					1						
							50	109	4	425	5	26																					1						
							50	111	4	117	4	26																					1						
							50	9000	4	475	3	26																					1						
							50	8007	0	24	6	23																	1	15	85	0	2						
							00	102	4	254	6	22	0	196	9	14	183	00	0	0	000	000	J	D	A	G	A	Y					1						
							00	104	4	1336	3	31																					1						
							00	109	4	950	5	22																					1						
							00	111	4	234	4	22																					1						
							00	9000	4	950	3	22																					2						
							00	8007	0	48	6	20																	2	15	85	0	2						

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Fig. 16: Emission of boilers No. 1 and 2, normal operation

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Steam boiler No. 3 which is fired by heavy oil "S" shows a load characteristic that is different from the other boilers as it deals with normal load. Operational records indicate 3 main load ranges

- half-load 52 % with a range of the variations from 40 to 60 % at approx. 4.200 hrs per annum
- part load 75 % with 60-90 % for approx. 2.800 hrs per annum
- full load 95 % with 90-100 % for approx. 1.400 hrs per annum.

The annual consumption of 43.000 t of fuel as listed e. g. in the firm's fuel inventory can therefore be roughly distributed as follows:

- fuel quantity 4.0 t/hr for 12 hrs per day (furnace capacity 52 %)
- fuel quantity 5.7 t/hr for 8 hrs per day (furnace capacity 75 %)
- fuel quantity 7.3 t/hr for 4 hrs per day (furnace capacity 95 %).

The quantity of fuel required for 100 % load is 7.65 t/hr.

It is not expedient to quote specific time details for the above-mentioned load ranges because they are not restricted to any particular period. They are however of restricted frequency and duration. They are differentiated in the emission data file by different modi of emission.

Special information concerning the time e. g. from 6 to 12 hours and 14 to 20 hours cannot be attained to the aforementioned load ranges. They may in principle occur as mean values, however, with a limited frequency and duration. By selecting different frequencies and durations of equal probability a realistic description of the emission rhythm can be made even without exact knowledge of its time position. Following this procedure the same probability results for an emission 12 times a day for 1 hour or 3 times a day for 4 hours.

The emission pattern and modi of boiler No. 3 for the period of the report investigation is illustrated by the entries in Table 5.

Table 5: Data relating to emission

Pattern of boiler No. 3

Load range (capacity)	Frequency	Duration	Time data	Mode code
52 %	12 x per day	in each case 1 hour	at any time possible	0100
75 %	8 x per day	in each case 1 hour	constantly possible	0200
95 %	4 x per day	in each case 1 hour	constantly possible	0300

The important emission data, normal operation of boiler No. 3 are recorded in Table 6. The completed coding form is given in Figure 17. The printout of these data and an extract are shown in Figures 22, 23 and 24.

Table 6: Emission data for boiler No. 3

Load range in (Furnace capacity)	%	52	75	95
Quantity of flue gas (wet) in	m^3/hr	60,000	76,000	95,000
Flue gas Temperature (Boiler end) in	K	453	453	453
SO_2-emissions 1) in	kg/hr	128	182	234
NO_2-emissions 2) in	kg/hr	30	52	62
CO -emissions 3) in	kg/hr	0,018	0,026	0,033
Emission of organic gases 4) in	kg/hr	0,40	0,57	0,73
Fly ash emission 5)	kg/hr	2,7	3,4	4,3

1) Sulfur content in fuel 1.6 %, no retention

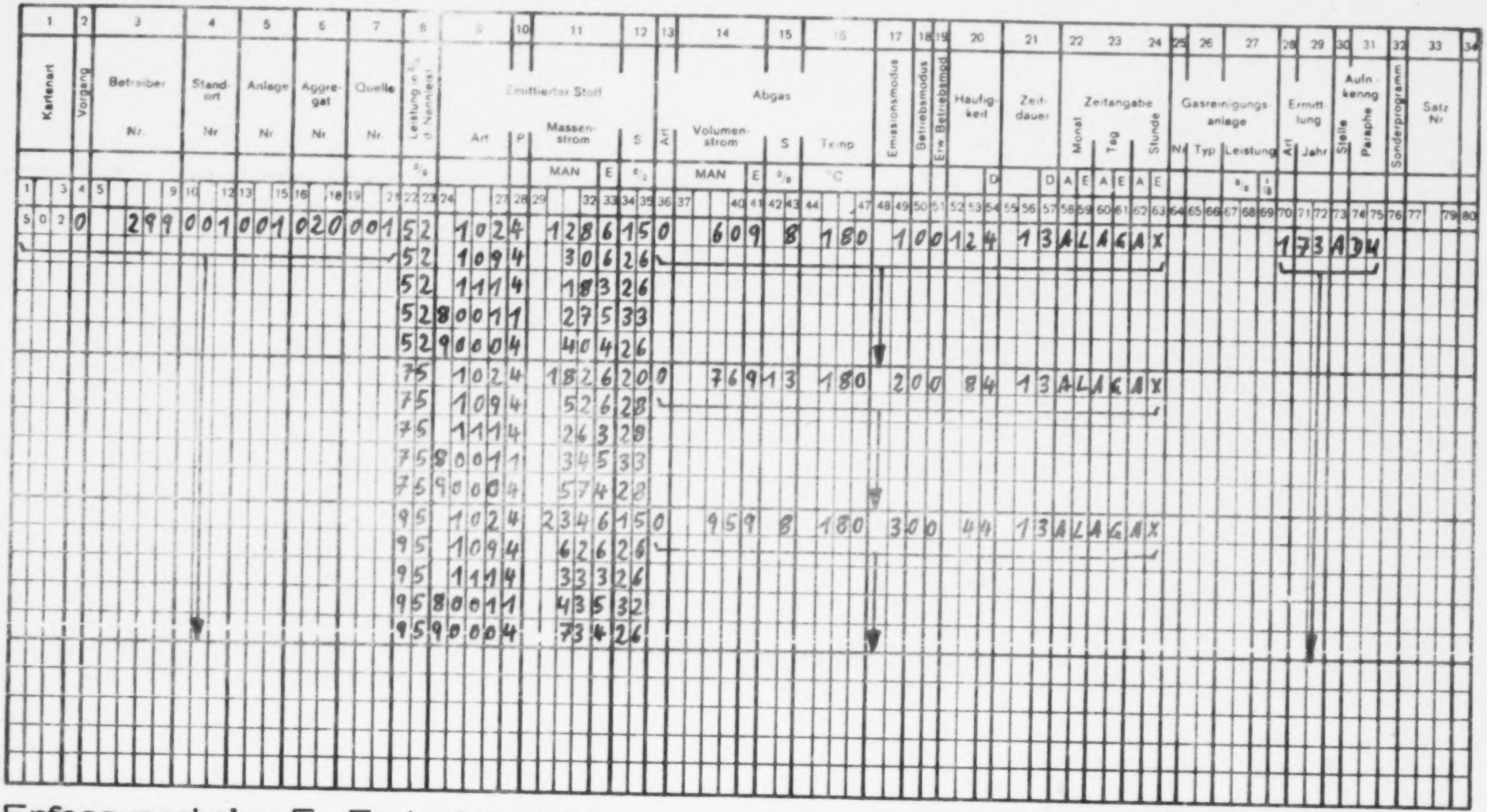
2) Ref. Kolar K_1 = 1.14 for firing equipment with air heater and K_2 = 0.14 for oil furnaces

3) CO emission 0.00456 kg/t fuel oil for oil furnaces with a furnace capacity of more than $105x10^6$ kJ/hr

4) Emission of organic gases 0.1 kg/t fuel oil for oil furnaces with a furnace capacity of more than $105x10^6$ kJ/hr

5) Dust concentrations approx. 45 mg/m^3 mean value from unpublished measurements

As regards normal operation of boilers Nos. 4 and 5 no essentially new features come to light so that it is not necessary to give a detailed description of the data collecting procedure. Relevant data are assembled in Table 7. The coding forms are given in Fig. 18 and the printout and the extract is also shown in Figures 22, 23 and 24.



Kartenart	Vorgang	Betreiber	Standort	Anlage	Aggregat	Quelle	Leistung in % d. Nennleist.	Emittierter Stoff					Abgas					Emissionsmodus	Betriebsmodus	Erw. Betriebsmod	Häufigkeit	Zeitdauer	Zeitangabe						Gasreinigungsanlage			Ermittlung		Aufn.kenng		Sonderprogramm	Satz Nr	
1	2	3 Nr.	4 Nr	5 Nr	6 Nr	7 Nr	8 %	9 Art	10 P	11 Massenstrom MAN	11 E	12 S %	13 Art	14 Volumenstrom MAN	14 E	15 S %	16 Temp °C	17	18	19	20 D	21 D	22 Monat A	22 Monat E	23 Tag A	23 Tag E	24 Stunde A	24 Stunde E	25 Nr	26 Typ	27 Leistung % 1/10	28 Art	29 Jahr	30 Stelle	31 Paraphe	32	33	34
502	0	299	001	001	020	001	52	102	4	128	6	15	0	60	9	8	180	1	0	0	124	13	A	L	A	G	A	X				1	73	A	DU			
							52	109	4	30	6	26																										
							52	111	4	18	3	26																										
							52	8001	1	27	5	33																										
							52	9000	4	40	4	26																										
							75	102	4	182	6	20	0	76	9	13	180	2	0	0	84	13	A	L	A	K	A	X										
							75	109	4	52	6	28																										
							75	111	4	26	3	28																										
							75	8001	1	34	5	33																										
							75	9000	4	57	4	28																										
							95	102	4	234	6	15	0	95	9	8	180	3	0	0	44	13	A	L	A	G	A	X										
							95	109	4	62	6	26																										
							95	111	4	33	3	26																										
							95	8001	1	43	5	32																										
							95	9000	4	73	4	26																										

Erfassungsbeleg E, Emissionsdaten ausgestellt am 9.10.73 von Dü

Fig. 17: Emission of boiler No. 3, normal operation

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Table 7: Emission data for boilers Nos. 4 and 5

		boiler No. 4	boiler No. 5
Load range	%	100	100
Quantity of flue gas (wet)	m^3/hr	176000	262000
Flue gas temperature	°C	140	160
SO_2-emissions	kg/hr	247	88
NO_2-emissions	kg/hr	115	122
CO -emissions	kg/hr	2.79	2.94
F^- -emissions	kg/hr	1.62	-
Emission of organic gases	kg/hr	1.12	1.18
Emission of fly ash from furnace			
- less than 10 μm	kg/hr	15	11
- more than 10 μm	kg/hr	5	5

1	2	3	4	5	6	7	8	9	10	11		12	13	14		15	16	17	18	19	20	21	22		23		24		25	26	27		28	29	30	31	32	33	34
Kartenart	Vorgang	Betreiber Nr.	Standort Nr.	Anlage Nr	Aggregat Nr	Quelle Nr.	Leistung d. Nennl.	Emittierter Stoff Art	P	Massenstrom		S	Abgas Art	Volumenstrom		S	Temp	Emissionsmodus	Betriebsmodus	Erw. Betriebsmod	Häufigkeit	Zeitdauer	Zeitangabe Monat		Tag		Stunde		Gasreinigungsanlage Nr	Typ	Leistung		Ermittlung Art	Jahr	Aufn.-kenng Stelle	Paraphe	Sonderprogramm	Satz Nr	
							%			MAN	E	%		MAN	E	%	°C				D	D	A	E	A	E	A	E			%	1/8							
1–3	4	5–9	10–12	13–15	16–18	19–21	22–23	24–27	28	29–32	33	34–35	36	37–40	41	42–43	44–47	48–49	50	51	52–54	55–57	58	59	60	61	62	63	64	65–66	67–68	69	70	71–72	73	74–75	76	77–79	80
502	0	299	001	001	030	002	00	102	4	247	6	26	0	176	9	12	140	00	0	0	000	000	A	L	A	E	A	X					1	73	A	DU			
								104	4	1616	3	36																					1						
								109	4	115	6	26																					1						
								111	4	279	4	26																					1						
								8007	1	15	6	29																	1	20	99	0	2						
								8007	0	5	6	28																	1	20	99	0	2						
								9000	4	112	4	26																					1						
					040	003	00	102	4	88	6	36		262	9	12	150	00	0	0	000	000	A	L	A	E	A	X					1						
								109	4	122	6	35																					1						
								111	4	294	4	25																					1						
								8006	1	11	6	28																	1	20	98	0	2						
								8006	0	5	6	28																	1	20	98	0	2						
								9000	4	118	4	26																					1						

Erfassungsbeleg E, Emissionsdaten ausgestellt am 8.10.73 von Dü

Fig. 18: Emissions of boilers No. 4 and 5, normal operation

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2.3.2.2 Abnormal situation in the emission behavior of the boilers

Primarily in the previous section the normal operation of the boilers was considered. In the following characteristic abnormal operating conditions will be described which can arise with this type of furnace.

In the example under discussion the starting-up and shutting-down methods of operation do not lead to any significant variants in emissions from normal operation. In the case of steam boiler furnaces of the described type, generally the heating surfaces have to be regularly cleaned while in operation. This process of "soot blowing" is usually carried out by means of steam, more rarely by means of compressed air. There are several blowers for each boiler and these are used consecutively where possible.

Soot blowing increases the dust emissions at the stack outlet. The potential increase in dust emissions is dependent upon:

- the quantity and consistency of the deposits clinging to the heating surfaces
- type and effectiveness of the soot blowers
- effectiveness of the dust collectors during soot blowing.

Because of the larger steam quantity required by soot blowing and with respect to the personnel of the power plant soot blowing is effected at the several boilers not simultaneausly and, if possible, in periods of low load.

The additional dust emissions accurring during soot blowing accumulate with the dust emissions from normal boiler operation. The hypotheses put forward in Table 8 concerning the emissions from boiler Nos. 1 to 5 originate from a few unpublished measurement values. In the case of coal fired boilers of a smaller design this ratio can be considerably higher than given in Table 8.

Table 8: Data relating to the soot blowing process for boilers Nos. 1 to 5

Boiler No(s)		1 and 2	3	4	5
Frequency of soot blowing		*)	4 x per month	10 x per month	10 x per month
Duration		15 mins.	20 mins.	30 mins.	30 mins.
Time data (real time)		22.00-2.00	22.00-2.00	22.00-2.00	22.00-2.00
Increase in dust emission A_R/A_O		2.5	4	2	2
Dust emissions A_O at maximum continuous rating	kg/hr	24.0	4.5	20	16
Dust emissions A_R during soot blowing	kg/hr	60.0	18.0	40	32
Additional dust emissions for soot blowing	kg/hr	36.0	13.5	20	16

*) i. e. in the winter months October to April each boiler 15 x per month, thus making a total of 30 x per month. For the remaining time from May to September 15 x per month.

By reason of their temporal interdependence (nonsimultaneous) the blowing processes are not allocated in the emission data file to the individual boilers (aggregates) but to the whole plant itself (facility/aggregate number 001/000). As the additional dust emissions caused by soot blowing are superposed to those of normal operation additively in data assembling the specification of a waste gas flow is not recorded (see Fig. 19 coding form).

For a complete examination of the emission characteristic of steam boilers it is also necessary to record malfunctions which occurred during the report investigation period. In the case of coal-fired boilers dust collector malfunctions are conceivable and should be borne in mind.

For the cyclone dust separators of boiler Nos. 1 and 2 the following causes of disturbances can be given:

- signs of wear and tear on multi-cyclones
- partial clogging of cyclone elements
- dislocation of dividing walls between untreated gas and filtered gas (e. g. as a result of a fire inside the dust collector).

This results in a decline in collector efficiency. Where there is regular servicing and inspection control (annual filter inspections) such malfunctions can be largely avoided. On the other hand they are very hard to detect during boiler operation. In the case of boilers Nos. 1 and 2 a malfunction occurred lasting 9 days (03 - 11 May). This occurred within the report investigation period. Here the dust emissions increased approximately threefold (lowering of collector efficiency to 55 %). This is synonymous with the hypothesis that in addition to the dust emissions A_O from normal operation of boilers Nos. 1 and 2 for this period there is yet another dust emission of 2 A_O.

With regard to the electrostatic dust separators of boilers Nos. 4 and 5 malfunctions can be caused by:

- contamination of spray electrodes, precipitator electrodes and/or insulators
- short-circuiting in the dust-collector
- damage to the rapping gear
- damage to the high voltage aggregates and regulating devices.

Such malfunctions are generally noticed quickly but not always immediately rectified.

In the example under discussion it is assumed that in the case of the electrostatic dust separators of each of the boilers Nos. 4 and 5 a filter zone twice failed to function each time for 3 days. It can be supposed that in each case precipitator efficiency sinks to 92 %; thus in the case of boiler No. 4 (normal efficiency 99 %) causing the dust emission to increase eightfold, with boiler No. 5 (normal efficiency 98 %) fourfold. These emissions caused by malfunctions are attributed to the aggregates 1.30 and 1.40.

As an alternative to normal operation the total dust quantities together with data of waste gas volume can be entered in the emission report. At the same time an appropriate shortening of emission periods as related to normal operation can be made.

With the oil-fired boiler No. 3 malfunctions can occur due to sudden deficiency of air and the subsequent soot formation. It is assumed that here 2 kg of soot forms per minute. A malfunction of this kind is generally noticed very quickly and dealt with immediately. Within the specified period this emission process occurred 5 x per month in each case for 2 minutes with boiler No. 3. It is unlikely that any other malfunctions in furnaces at the power station relevant to emission will occur.

The relevant data for malfunctions are given in Table 9.

Table 9: Malfunctions during the operation of boiler Nos. 1 to 5

Boiler No.	Frequency of malfunciton	Emission dust *) kg/hr
1 + 2	1 x per year for 9 days	48
3	5 x per month for 2 minutes	120
4	2 x per year for 3 days	160 of which 40 > 10 µm 120 < 10 µm
5	2 x per year for 3 days	64 of which 19 > 10 µm 45 < 10 µm

*) in addition to emissions from normal operation

The completed coding forms for all abnormal situations in the emission behavior are given in Figure 19. The printout of the data and an extract are shown in Figures 22, 23 and 24. The code numbers can be taken of corresponding catalogues. Examples are given as follows:

- frequency and duration

155/152	15 times per month for 15 minutes
305/152	30 times per month for 15 minutes
045/201	4 times per month for 20 minutes
105/302	10 times per month for 30 minutes
107/035	10 times per 100 years for 3 months
055/022	5 times per month for 2 minutes
026/034	2 times per year for 3 days

- coding number for kind of recording

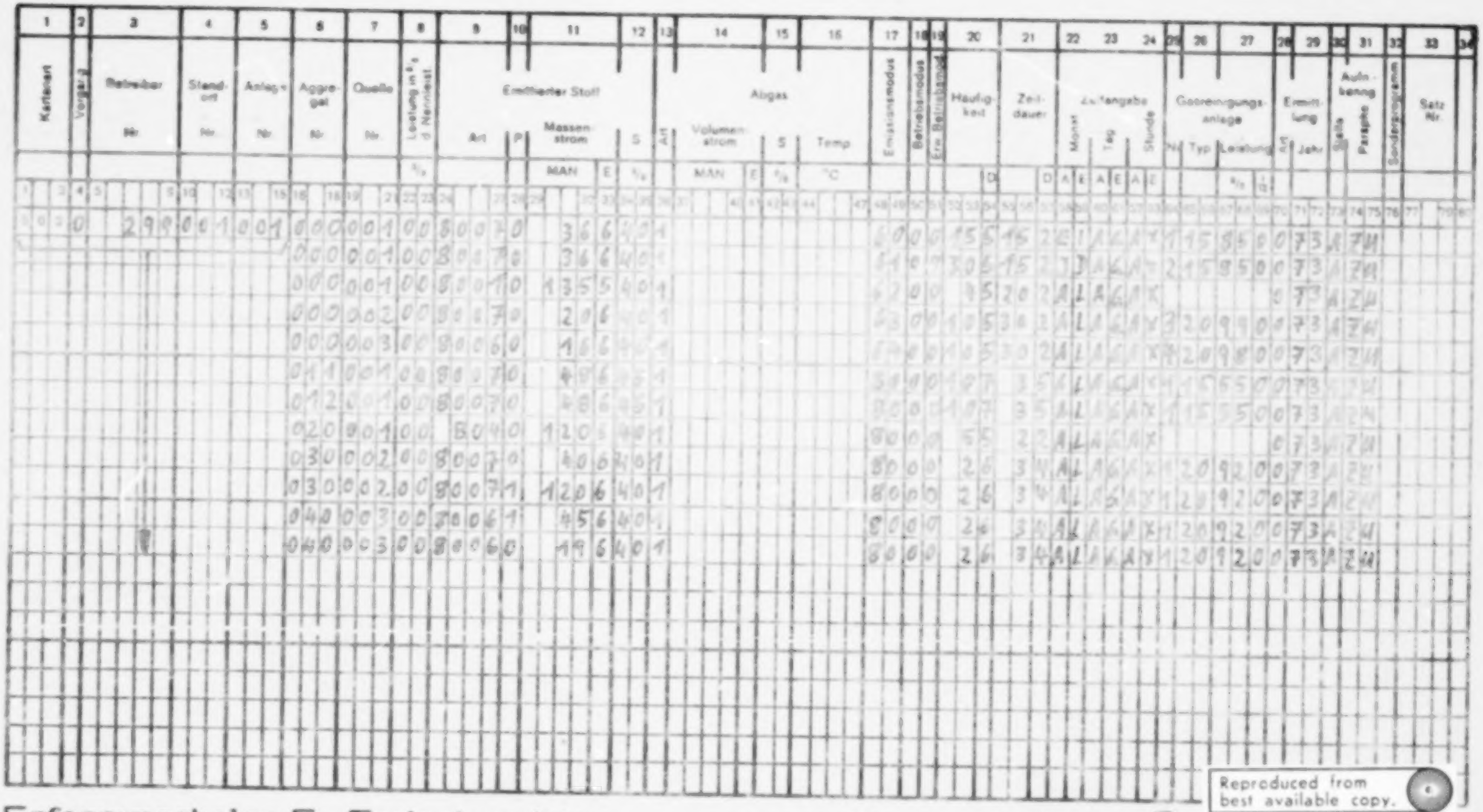
0	comparative estimation

The description of the modes especially in exceptional cases or accidental releases can be detailled in the mode text data file; this gives additional information to the emission data file. The corresponding coding form with explanation is displayed in Fig. 20.

2.3.3 Emissions of the fuel tanks and cooling towers

For a complete examination of the emissions characteristics of a power plant it is also necessary to record the storage tanks and the cooling towers.

Whenever the storage tanks are filled with heavy fuel oil a waste air stream equivalent to the quantity of oil put into the tanks escapes through the tank outlet. This waste air stream is contaminated by organic vapors from fuel oil "S".



1 Kartenart	2 Vorgang	3 Betreiber Nr	4 Standort Nr	5 Anlage Nr	6 Aggregat Nr	7 Quelle Nr	8 Leistung in % d Nennleist. %	9 Emittierter Stoff Art	10 P	11 Massenstrom MAN	11 E	12 S %	13 Abgas Art	14 Volumenstrom MAN	14 E	15 S %	16 Temp °C	17 Emissionsmodus	18 Betriebsmodus	19 Erw. Betriebsmod.	20 Häufigkeit	20 D	21 Zeitdauer	21 D	22 Zeitangabe Monat A	22 Monat E	23 Tag A	23 Tag E	24 Stunde A	24 Stunde E	25 Gasreinigungsanlage Nr	26 Typ	27 Leistung %	28 Ermittlung Art	29 Jahr	30 Aufn.-kennung Stelle	31 Paragraph	32 Sonderprogramm	33 Satz Nr
003	0	299	001	001	000	001	00	8007	0	36	6	40	1					60	0	0	15	5	16	2	E	1	A	K	A	X	1	15	850	0	73	A	ZW		
					000	001	00	8007	0	36	6	40	1					61	0	0	30	5	15	2	J	J	A	K	A	X	2	15	950	0	73	A	ZW		
					000	001	00	8001	0	135	5	40	1					62	0	0	9	5	20	2	A	L	A	G	A	X				0	73	A	ZW		
					000	002	00	8007	0	20	6	40	1					63	0	0	10	5	36	1	A	L	A	G	A	X	3	20	990	0	73	A	ZW		
					000	003	00	8006	0	16	6	40	1					64	0	0	10	5	30	2	A	L	A	G	A	X	3	20	980	0	73	A	ZW		
					011	001	00	8007	0	49	6	40	1					58	0	0	19	7	3	5	A	L	A	G	A	X	1	15	550	0	73	A	ZW		
					012	001	00	8007	0	48	6	40	1					80	0	0	18	7	3	5	A	L	A	G	A	X	1	15	550	0	73	A	ZW		
					020	001	00	B04	0	120	5	40	1					80	0	0	5	5	2	2	A	L	A	G	A	X				0	73	A	ZW		
					030	002	00	8007	0	40	6	40	1					80	0	0	2	6	3	4	A	L	A	G	A	X	1	20	920	0	73	A	ZW		
					030	002	00	8007	1	120	6	40	1					80	0	0	2	6	3	4	A	L	A	G	A	X	1	20	920	0	73	A	ZW		
					040	003	00	8006	1	45	6	40	1					80	0	0	2	6	3	4	A	L	A	G	A	X	1	20	920	0	73	A	ZW		
					040	003	00	8006	0	19	6	40	1					80	0	0	2	6	3	4	A	L	A	K	A	X	1	20	920	0	73	A	ZW		

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Fig. 19: Emissions in abnormal situations for the boilers Nos. 1 - 5

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1	2	3	4	5	6	7	8	9	10	11
Kartenart	Vorgang	Betreiber Nr.	Standort Nr.	Anlage Nr.	Aggregat Nr.	Quelle Nr.	Emissionsmodus	Betriebsmodus	Erw. Betriebsmod.	Bezeichnung
[illegible]	01	294	101	001	000	001	60	0	0	SOOT BLOWING BOILER NO.1 OR NO.2
					000	001	61	0	0	SOOT BLOWING BOILER NO.1 AND NO.2
					000	001	62	0	0	SOOT BLOWING BOILER NO.3
					000	002	63	0	0	SOOT BLOWING BOILER NO.4
					000	003	64	0	0	SOOT BLOWING BOILER NO.5
					[illegible]	001	80	0	0	MALFUNCTION OF CONTROL DEVICE BOILER NO.1
					[illegible]	001	80	0	0	MALFUNCTION OF CONTROL DEVICE BOILER NO.2
					[illegible]	001	80	0	0	MALFUNCTION BOILER NO.3/DEFICIENCY OF AIR
					[illegible]	002	80	0	0	MALFUNCTION OF CONTROL DEVICE BOILER NO.4
					[illegible]	003	80	0	0	MALFUNCTION OF CONTROL DEVICE BOILER NO.5

Erfassungsbeleg EM, Bezeichnung Emissionsmodus ausgestellt am 15.10.73 von Zü

Fig. 20: Completed coding form for the mode text file

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The fuel oil is delivered by fuel tanker lorries with a capacity of 31 m^3. With an annual consumption of 43.000 t there will be 94 deliveries per month.

Measurements of comparable fuel tanks have resulted in a concentration of 290 mg/m^3 at a temperature of 348 K. With a flue gas stream of 15.5 m^3/hr the filling process can be calculated.

The same concentration in the exhaust air is to be expected from the tanks' breathing, which here is supposed to be generated mainly by the cycle of temperature control of the heating of the tanks and less by influences of the weather. This process of tank breathing can be represented in a simplified manner as a steady, quasicontinuous emission process owing to the small quantities emitted.

Emissions caused by the fuel oil S leaking out of flanges, stuffing boxes, and shaft packings are distinctly small, because possible pores are clogged by oil residues and, moreover, because heavy oil S leaking as fluid immediately solidifies on the outside of the tanks owing to quick cooling; only few parts of the leaking substances reach the atmosphere as gases or vapors. The emissions of the fuel oil depot, estimated roughly, are presented in Table 10.

Table 10: Data of emission processes at the fuel oil tanks

modus of emission	frequency and duration	flow of organic gases emitted mg/hr	flow of waste gas m^3/hr	temperature of waste gas K
filling process (06)	94 time in a month for 2 hours	45.10^3	15,50	348
tank breathing (00)	quasi-continuously	35.10^1	0,12	348
leakages (00)	continuously	2.10^3	-	293

Tank breathing and leakages of the fuel depot can be recorded together in the emission data file.

By the waste steam of the cooling towers about 143 t/hr water vapor are emitted, on an average, together with a waste gas flow of about 6.10^6 m^3/h for each cooling tower and at a waste gas temperature of 296 K. About 138 t/h of this vapor are gaseous (phase 4) and about 5 t/hr a fluid dispersed like an aerosol (phase 3).

Table 11: Emission data for the cooling towers

		cooling tower	
		No. 1	No. 2
Quantity of flue gas (wet)	ml^3/hr	6000.10^9	6000.10^9
Flue gas temperature	°C	23	23
Water-emissions gaseaus	t/hr	138	138
Water-emissions fluid dispered	t/hr	5	5

The completed coding form for all emission processes of the tanks and cooling towers are presented in Figure 21.

2.3.4 Complete output and annual emissions

In Table 12 the individual values are added up to the annual emission rates.

Table 12: Annual emission rates of the power plant

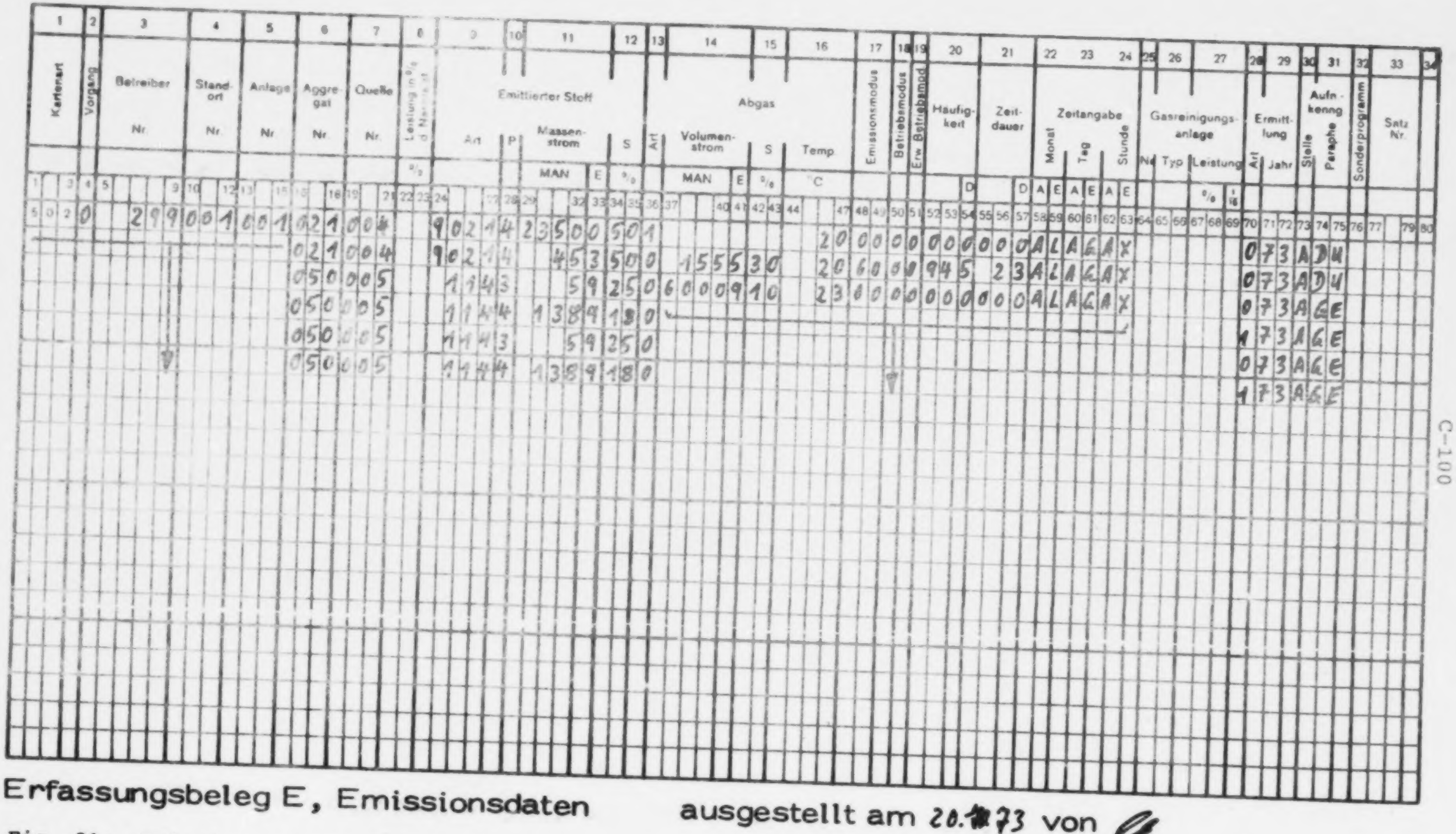
substance	emission rate kg/a
Sulphur dioxide	$6{,}1 \cdot 10^{6}$
Nitrogen-(IV)-Oxide	$3{,}0 \cdot 10^{6}$
Carbon monoxide	$6{,}7 \cdot 10^{4}$
Hydrogen fluorine	$2{,}3 \cdot 10^{4}$
Organic substances	$3{,}1 \cdot 10^{4}$
Dust of which	$7{,}3 \cdot 10^{5}$
- from pit-coal firing	$5{,}6 \cdot 10^{5}$
- from lignite firing	$1{,}5 \cdot 10^{5}$
- from fuel oil firing	$2{,}8 \cdot 10^{4}$
- Carbon (soot)	$4{,}0 \cdot$
Water	$2{,}5 \cdot 10^{9}$

Fig. 22 shows the output of all emissions data for the whole power plant and Figs. 23 and 24 give an extract of these data which include the total emissions of the whole plant for each emitted substance.

2.4 Substance data file

For demonstration purposes the coding forms for the substances handled in this example are shown in Figs. 25 to 38.

An extract of the substance data file is given in Figs. 39 and 40. Fig. 39 shows an extract of the numerically sorted list and Fig. 40 is a formula-sorted list. Another alternative is an alphabetically sorted list.



1	2	3	4	5	6	7	8	9	10	11		12	13	14		15	16	17	18	19	20	21	22		23		24		25	26	27	28	29	30	31	32	33	34
Kartenart	Vorgang	Betreiber Nr.	Standort Nr.	Anlage Nr.	Aggregat Nr.	Quelle Nr.	Leistung in % d. Nennlast	Emittierter Stoff Art	P	Massenstrom MAN	E	S %	Abgas Art	Volumenstrom MAN	E	S %	Temp °C	Emissionsmodus	Betriebsmodus	Erw Betriebsmod	Häufigkeit D	Zeitdauer D	Zeitangabe Monat A	E	Tag A	E	Stunde A	E	Gasreinigungsanlage Nr	Typ	Leistung %	Ermittlung Art	Jahr	Aufn.-kenng Stelle	Paraphe	Sonderprogramm	Satz Nr.	
1–3	4	5–9	10–12	13–15	16–18	19–21	22–23	24–27	28	29–32	33	34–35	36	37–40	41	42–43	44–47	48–49	50	51	52–54	55–57	58	59	60	61	62	63	64	65–66	67–69	70	71–72	73	74–75	76	77–79	80
502	0	299	001	001	021	004		9021	4	2350	0	50	1				20	00	0	0	000	000	A	L	A	G	A	X				0	73	A	DU			
					021	004		9021	4	45	3	50	0	155	5	30	20	60	0	9	945	23	A	L	A	G	A	X				0	73	A	DU			
					050	005		114	3	5	9	25	0	6000	9	10	23	00	0	0	000	000	A	L	A	G	A	X				0	73	A	GE			
					050	005		114	4	138	9	18	0																			1	73	A	GE			
					050	005		114	3	5	9	25	0																			0	73	A	GE			
					050	005		114	4	138	9	18	0																			1	73	A	GE			

Erfassungsbeleg E, Emissionsdaten ausgestellt am 20.[illegible]73 von

Fig. 21: Emissions of the tanks and cooling towers

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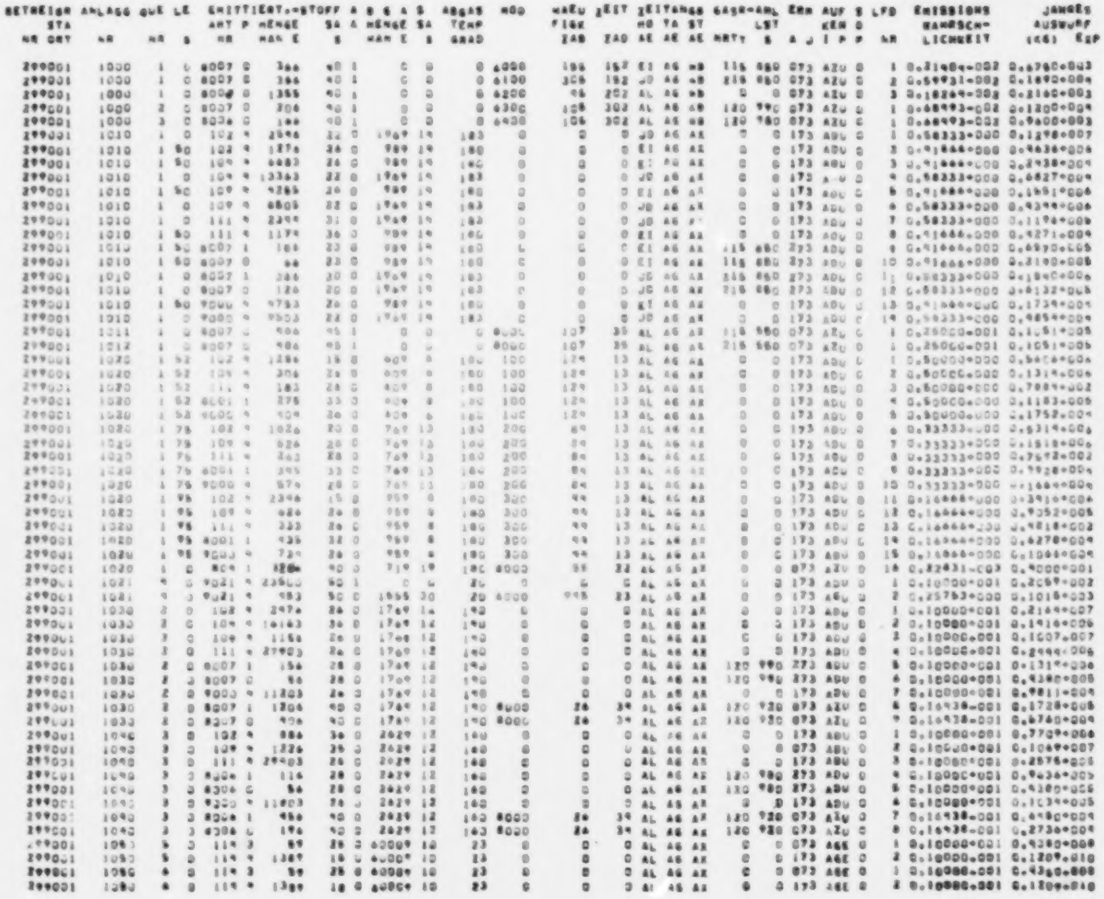

Fig. 22: Printout of the emission data file for the whole power plant

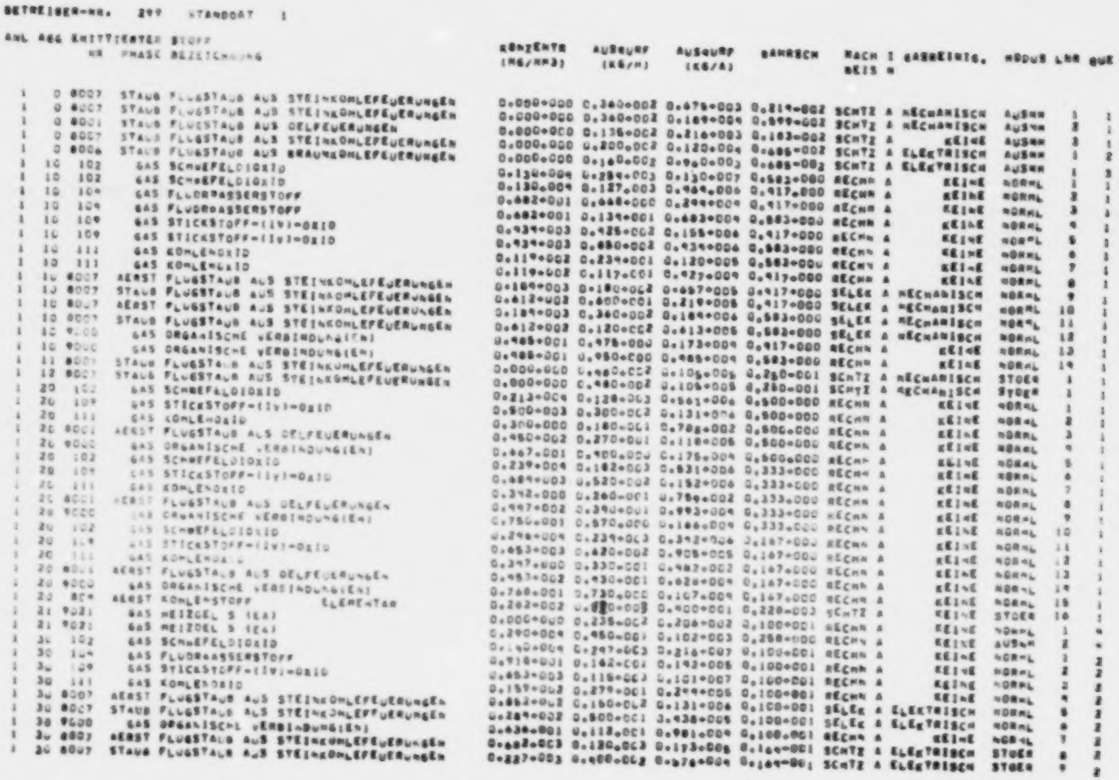

Fig. 23: Text printout of the emission data file for the whole power plant with a summary of the annual emissions for each substance

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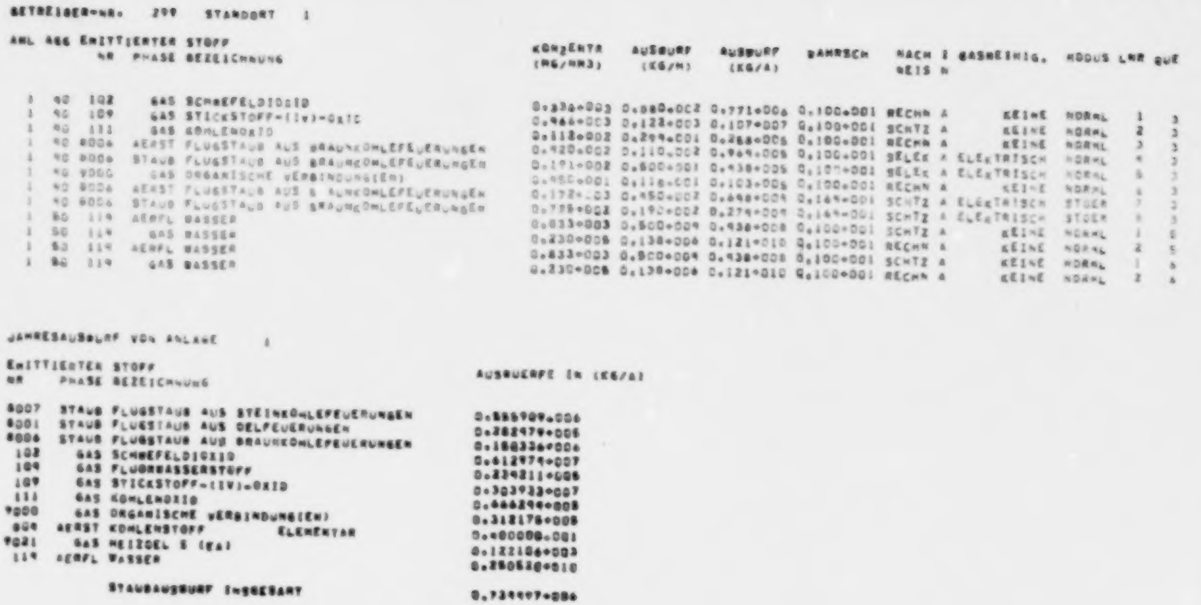
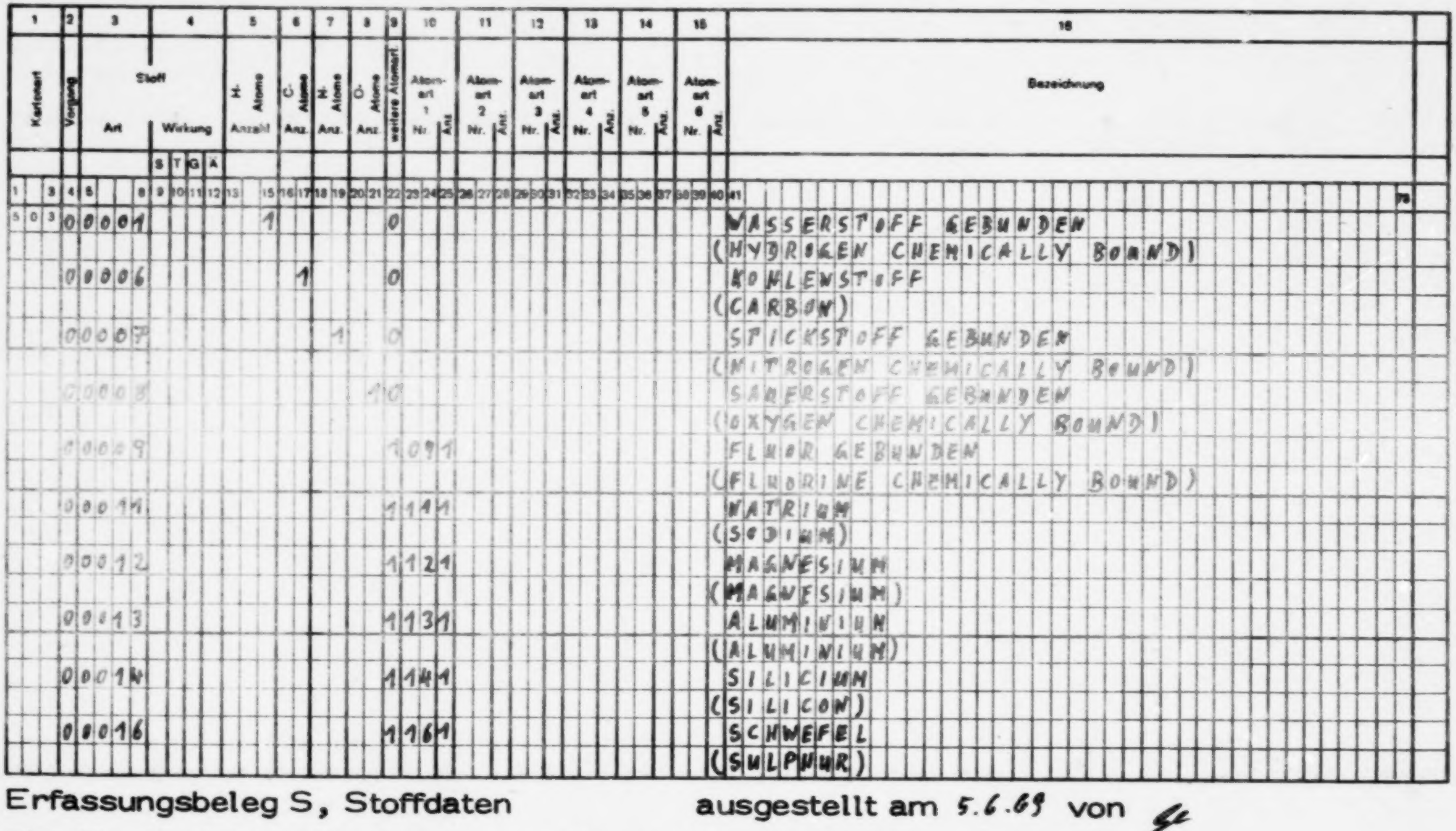


```
BETREIBER-NR.   299   STANDORT   1

ANL ABG EMITTIERTER STOFF                                          KONZENTR   AUSWURF   AUSWURF   WAHRSCH   NACH I GASREINIG.  MODUS LNR QUE
         NR  PHASE BEZEICHNUNG                                     (MG/NM3)    (KG/H)    (KG/A)             WEIS N

  1  90  102    GAS SCHWEFELDIOXID                                 0.336+003 0.880+002 0.771+006 0.100+001 RECHN A      KEINE  NORML   1   3
  1  90  109    GAS STICKSTOFF-(IV)-OXID                           0.946+003 0.123+003 0.107+007 0.100+001 SCHTZ A      KEINE  NORML   2   3
  1  90  111    GAS KOHLENOXID                                     0.118+002 0.299+001 0.268+005 0.100+001 RECHN A      KEINE  NORML   3   3
  1  90 8006  AERST FLUGSTAUB AUS BRAUNKOHLEFEUERUNGEN             0.920+002 0.110+002 0.969+005 0.100+001 SELEK A ELEKTRISCH  NORML   4   3
  1  90 8006  STAUB FLUGSTAUB AUS BRAUNKOHLEFEUERUNGEN             0.171+002 0.600+001 0.438+005 0.107+001 SELEK A ELEKTRISCH  NORML   5   3
  1  90 9000    GAS ORGANISCHE VERBINDUNG(EN)                      0.950+001 0.118+001 0.103+005 0.100+001 RECHN A      KEINE  NORML   6   3
  1  90 8006  AERST FLUGSTAUB AUS B AUNKOHLEFEUERUNGEN             0.172+003 0.450+002 0.698+004 0.169+001 SCHTZ A ELEKTRISCH  STOER   7   3
  1  90 8006  STAUB FLUGSTAUB AUS BRAUNKOHLEFEUERUNGEN             0.775+002 0.190+002 0.274+004 0.169+001 SCHTZ A ELEKTRISCH  STOER   8   3
  1  80  119  AERFL WASSER                                         0.833+003 0.500+004 0.438+008 0.100+001 SCHTZ A      KEINE  NORML   1   5
  1  50  119    GAS WASSER                                         0.230+006 0.138+006 0.121+010 0.100+001 RECHN A      KEINE  NORML   2   5
  1  53  119  AERFL WASSER                                         0.833+003 0.500+004 0.438+008 0.100+001 SCHTZ A      KEINE  NORML   1   6
  1  80  119    GAS WASSER                                         0.230+006 0.138+006 0.121+010 0.100+001 RECHN A      KEINE  NORML   2   6


JAHRESAUSWURF VON ANLAGE     1

EMITTIERTER STOFF
NR     PHASE BEZEICHNUNG                                   AUSWUERFE IN (KG/A)

8007   STAUB FLUGSTAUB AUS STEINKOHLEFEUERUNGEN             0.555909+006
8001   STAUB FLUGSTAUB AUS OELFEUERUNGEN                    0.282979+005
8006   STAUB FLUGSTAUB AUS BRAUNKOHLEFEUERUNGEN             0.180336+006
 102     GAS SCHWEFELDIOXID                                 0.612979+007
 104     GAS FLUORWASSERSTOFF                               0.234211+006
 109     GAS STICKSTOFF-(IV)-OXID                           0.303933+007
 111     GAS KOHLENOXID                                     0.466294+005
9000     GAS ORGANISCHE VERBINDUNG(EN)                      0.312176+005
 804   AERST KOHLENSTOFF           ELEMENTAR                0.400000+001
9021     GAS HEIZOEL S (EA)                                 0.122186+003
 119   AERFL WASSER                                         0.250528+010

             STAUBAUSWURF INSGESAMT                         0.734997+006
```

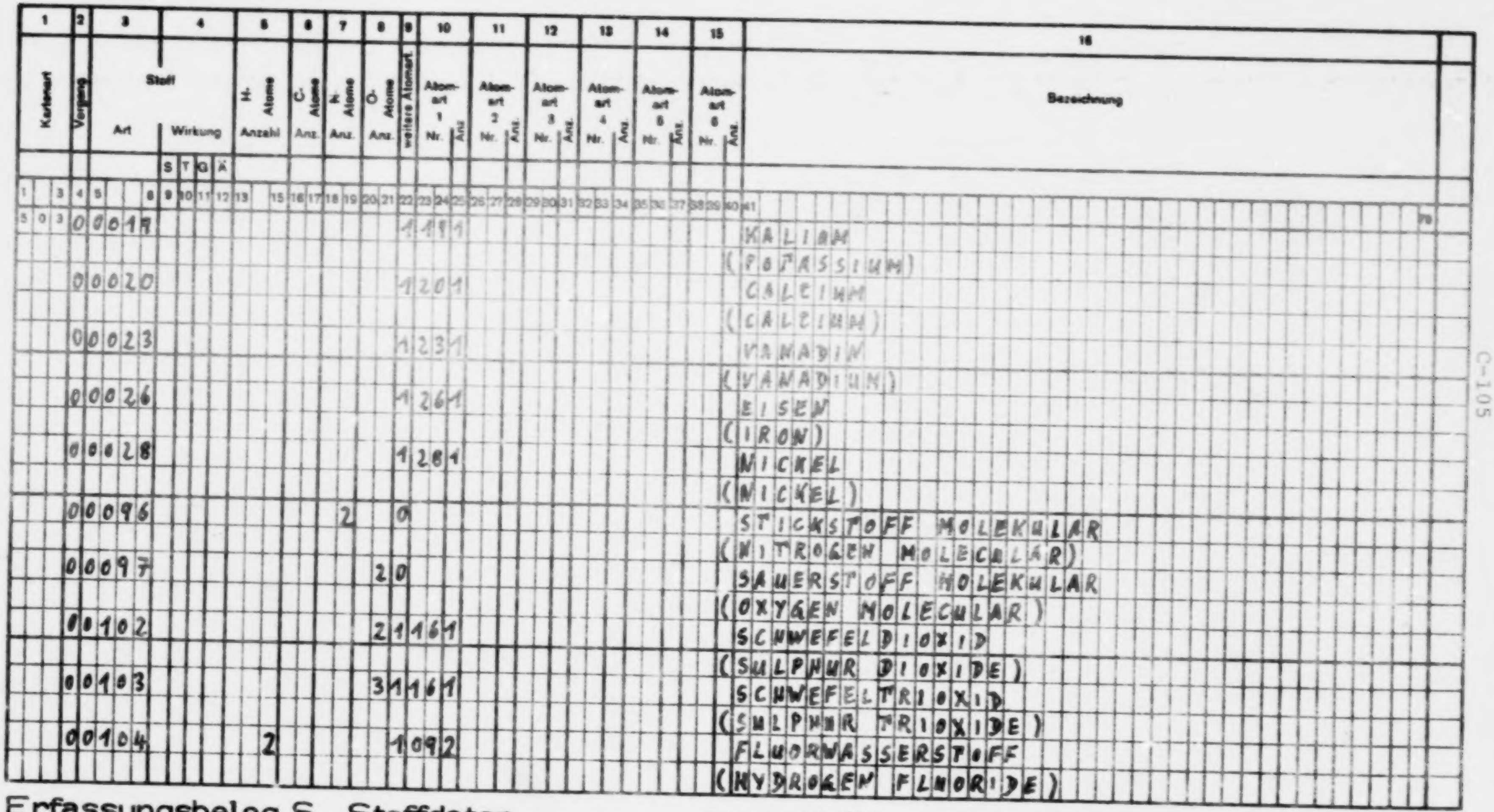
Fig. 24: Text printout of the emission data file for the whole power plant with a summary of the annual emissions for each substance (continuation of Fig. 23)



1	2	3	4				5	6	7	8	9	10		11		12		13		14		15		16
Kartenart	Vorgang	Stoff Art	Stoff Wirkung				H-Atome Anzahl	C-Atome Anz.	N-Atome Anz.	O-Atome Anz.	weitere Atomart	Atomart 1 Nr.	Anz.	Atomart 2 Nr.	Anz.	Atomart 3 Nr.	Anz.	Atomart 4 Nr.	Anz.	Atomart 5 Nr.	Anz.	Atomart 6 Nr.	Anz.	Bezeichnung
			S	T	G	Ä																		
1 3	4	5 8	9	10	11	12	13 15	16 17	18 19	20 21	22	23 24	25	26 27	28	29 30	31	32 33	34	35 36	37	38 39	40	41 79
503	0	0001					1				0													WASSERSTOFF GEBUNDEN
																								(HYDROGEN CHEMICALLY BOUND)
	0	0006						1			0													KOHLENSTOFF
																								(CARBON)
	0	0007							1		0													STICKSTOFF GEBUNDEN
																								(NITROGEN CHEMICALLY BOUND)
	0	0008								1	0													SAUERSTOFF GEBUNDEN
																								(OXYGEN CHEMICALLY BOUND)
	0	0009									1	09	1											FLUOR GEBUNDEN
																								(FLUORINE CHEMICALLY BOUND)
	0	0011									1	11	1											NATRIUM
																								(SODIUM)
	0	0012									1	12	1											MAGNESIUM
																								(MAGNESIUM)
	0	0013									1	13	1											ALUMINIUM
																								(ALUMINIUM)
	0	0014									1	14	1											SILICIUM
																								(SILICON)
	0	0016									1	16	1											SCHWEFEL
																								(SULPHUR)

Erfassungsbeleg S, Stoffdaten ausgestellt am 5.6.69 von

Fig. 25: Completed coding form for the substance data file



1	2	3	4				5	6	7	8	9	10		11		12		13		14		15		16
Kartenart	Vorgang	Stoff Art	Stoff Wirkung				H-Atome Anzahl	C-Atome Anz.	N-Atome Anz.	O-Atome Anz.	weitere Atomart	Atomart 1 Nr.	Anz.	Atomart 2 Nr.	Anz.	Atomart 3 Nr.	Anz.	Atomart 4 Nr.	Anz.	Atomart 5 Nr.	Anz.	Atomart 6 Nr.	Anz.	Bezeichnung
			S	T	G	Ä																		
1 3	4	5 8	9	10	11	12	13 15	16 17	18 19	20 21	22	23 24	25	26 27	28	29 30	31	32 33	34	35 36	37	38 39	40	41 70
503	0	0017									1	19	1											KALIUM
																								(POTASSIUM)
	0	0020									1	20	1											CALCIUM
																								(CALCIUM)
	0	0023									1	23	1											VANADIN
																								(VANADIUM)
	0	0026									1	26	1											EISEN
																								(IRON)
	0	0028									1	28	1											NICKEL
																								(NICKEL)
	0	0096							2		0													STICKSTOFF MOLEKULAR
																								(NITROGEN MOLECULAR)
	0	0097								2	0													SAUERSTOFF MOLEKULAR
																								(OXYGEN MOLECULAR)
	0	0102								2	1	16	1											SCHWEFELDIOXID
																								(SULPHUR DIOXIDE)
	0	0103								3	1	16	1											SCHWEFELTRIOXID
																								(SULPHUR TRIOXIDE)
	0	0104					2				1	09	2											FLUORWASSERSTOFF
																								(HYDROGEN FLUORIDE)

Erfassungsbeleg S, Stoffdaten ausgestellt am 5.6.69 von

Fig. 26: Completed coding form for the substance data file

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1	2	3	4	5	6	7	8	9	10		11		12		13		14		15		16
Kartenart	Vorgang	Stoff Art	Stoff Wirkung	H-Atome Anzahl	C-Atome Anz.	N-Atome Anz.	O-Atome Anz.	weitere Atomart	Atomart 1 Nr.	Anz.	Atomart 2 Nr.	Anz.	Atomart 3 Nr.	Anz.	Atomart 4 Nr.	Anz.	Atomart 5 Nr.	Anz.	Atomart 6 Nr.	Anz.	Bezeichnung
			S T G X																		
1 3	4	5 8	9 10 11 12	13 15	16 17	18 19	20 21	22	23 24	25	26 27	28	29 30	31	32 33	34	35 36	37	38 39	40	41 78
503	0	0109				1	2	0													STICKSTOFF-(IV)-OXID
																					(NITROGEN-(IV)-OXIDE)
	0	0111			1		1	0													KOHLENOXID
																					(CARBON MONOXIDE)
	0	0114		2			1	0													WASSER
																					(WATER)
	0	0120					1	1	20	1											CALCIUMOXID
																					(CALCIUM OXIDE)
	0	0121					1	1	12	1											MAGNESIUMOXID
																					(MAGNESIUM OXIDE)
	0	0123					1	1	28	1											NICKEL-(II)-OXID
																					(NICKEL OXIDE)
	0	0125					5	1	23	2											VANADIUM-(V)-OXID
																					(VANADIUM-(V)-OXIDE)
	0	0128					3	1	13	2											ALUMINIUMOXID
																					(ALUMINIUM OXIDE)
	0	0129					2	1	14	1											SILICIUMDIOXID
																					(SILICON DIOXIDE)
	0	0161					1	1	11	2											NATRIUMOXID
																					(SODIUM-OXIDE)

Erfassungsbeleg S, Stoffdaten ausgestellt am 5.6.69 von

Fig. 27: Completed coding form for the substance data file

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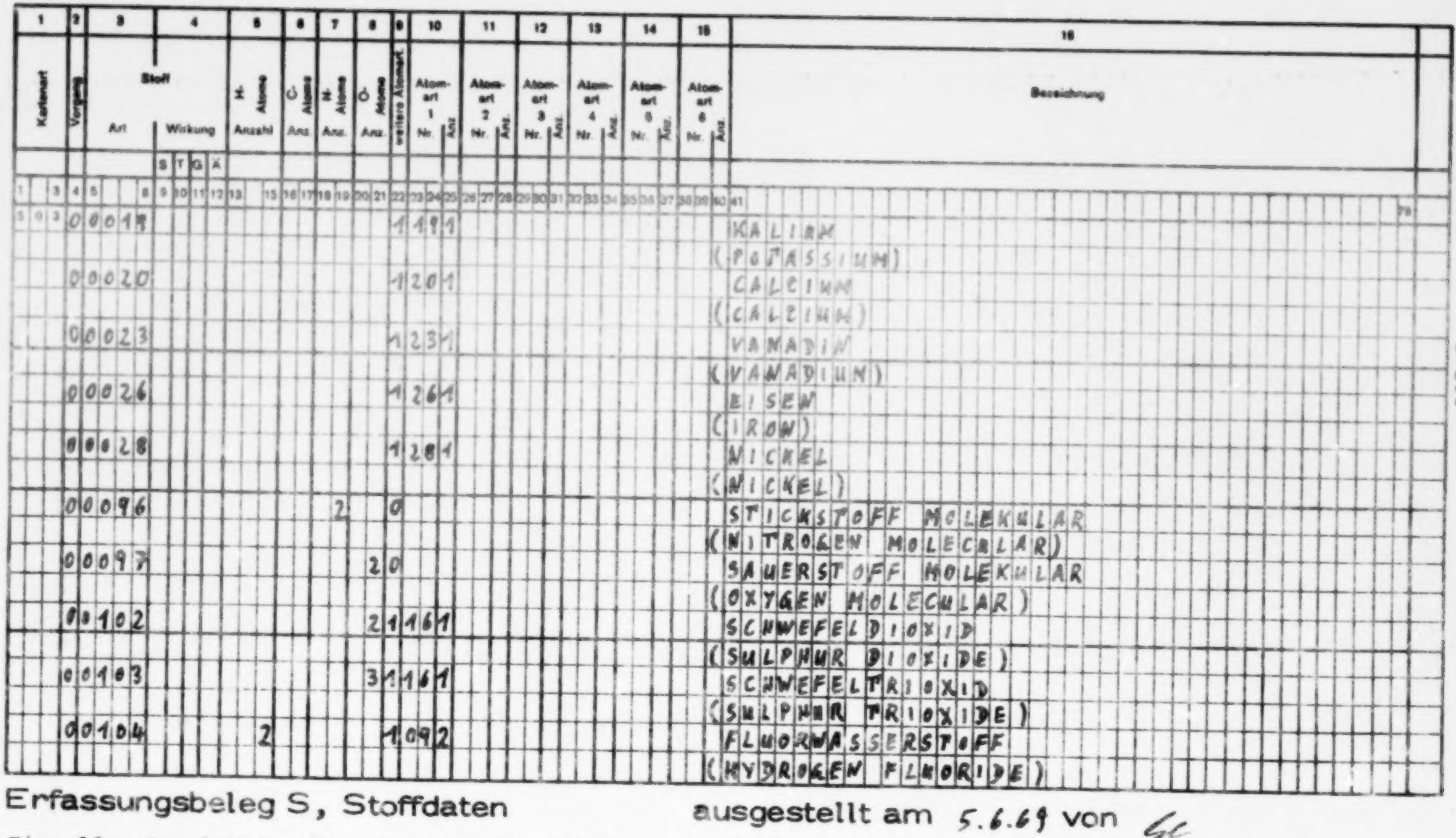

1	2	3	4	5	6	7	8	9	10		11		12		13		14		15		16
Kartenart	Vorgang	Stoff Art	Stoff Wirkung	H-Atome Anzahl	C-Atome Anz.	N-Atome Anz.	O-Atome Anz.	weitere Atomart	Atom-art 1 Nr.	Anz.	Atom-art 2 Nr.	Anz.	Atom-art 3 Nr.	Anz.	Atom-art 4 Nr.	Anz.	Atom-art 5 Nr.	Anz.	Atom-art 6 Nr.	Anz.	Bezeichnung
			S T G Ä																		
1 3	4	5 8	9 10 11 12	13 15	16 17	18 19	20 21	22	23 24	25	26 27	28	29 30	31	32 33	34	35 36	37	38 39	40	41 79
5 0 3	0	0019						1	19	1											KALIUM
																					(POTASSIUM)
	0	0020						1	20	1											CALCIUM
																					(CALZIUM)
	0	0023						1	23	1											VANADIN
																					(VANADIUM)
	0	0026						1	26	1											EISEN
																					(IRON)
	0	0028						1	28	1											NICKEL
																					(NICKEL)
	0	0096				2		0													STICKSTOFF MOLEKULAR
																					(NITROGEN MOLECULAR)
	0	0097					2	0													SAUERSTOFF MOLEKULAR
																					(OXYGEN MOLECULAR)
	0	0102					2	1	16	1											SCHWEFELDIOXID
																					(SULPHUR DIOXIDE)
	0	0103					3	1	16	1											SCHWEFELTRIOXID
																					(SULPHUR TRIOXIDE)
	0	0104		2				1	09	2											FLUORWASSERSTOFF
																					(HYDROGEN FLUORIDE)

Erfassungsbeleg S, Stoffdaten ausgestellt am 5.6.69 von

Fig. 26: Completed coding form for the substance data file

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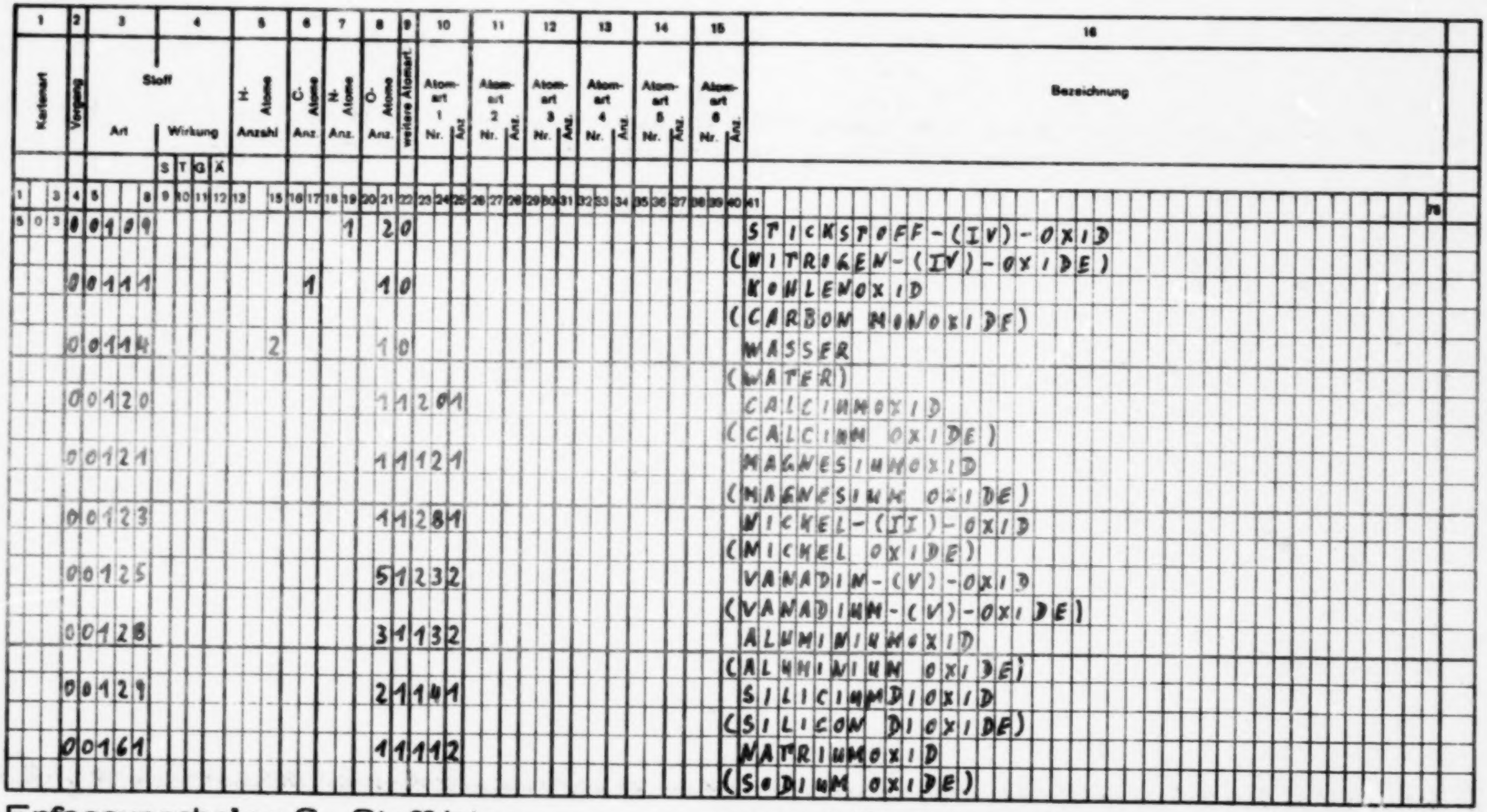

1	2	3	4				5	6	7	8	9	10		11		12		13		14		15		16
Kartenart	Vorgang	Stoff Art	Stoff Wirkung				H-Atome Anzahl	C-Atome Anz.	N-Atome Anz.	O-Atome Anz.	weitere Atomart	Atomart 1 Nr.	Anz.	Atomart 2 Nr.	Anz.	Atomart 3 Nr.	Anz.	Atomart 4 Nr.	Anz.	Atomart 5 Nr.	Anz.	Atomart 6 Nr.	Anz.	Bezeichnung
			S	T	G	Ä																		
1 3	4	5 8	9	10	11	12	13 15	16 17	18 19	20 21	22	23 24	25	26 27	28	29 30	31	32 33	34	35 36	37	38 39	40	41
503	0	0109							1	2	0													STICKSTOFF-(IV)-OXID
																								(NITROGEN-(IV)-OXIDE)
	0	0111						1		1	0													KOHLENOXID
																								(CARBON MONOXIDE)
	0	0114					2			1	0													WASSER
																								(WATER)
	0	0120								1	1	20	1											CALCIUMOXID
																								(CALCIUM OXIDE)
	0	0121								1	1	12	1											MAGNESIUMOXID
																								(MAGNESIUM OXIDE)
	0	0123								1	1	28	1											NICKEL-(II)-OXID
																								(NICKEL OXIDE)
	0	0125								5	1	23	2											VANADIN-(V)-OXID
																								(VANADIUM-(V)-OXIDE)
	0	0128								3	1	13	2											ALUMINIUMOXID
																								(ALUMINIUM OXIDE)
	0	0129								2	1	14	1											SILICIUMDIOXID
																								(SILICON DIOXIDE)
	0	0161								1	1	11	2											NATRIUMOXID
																								(SODIUM OXIDE)

Erfassungsbeleg S, Stoffdaten ausgestellt am 5.6.69 von

Fig. 27: Completed coding form for the substance data file

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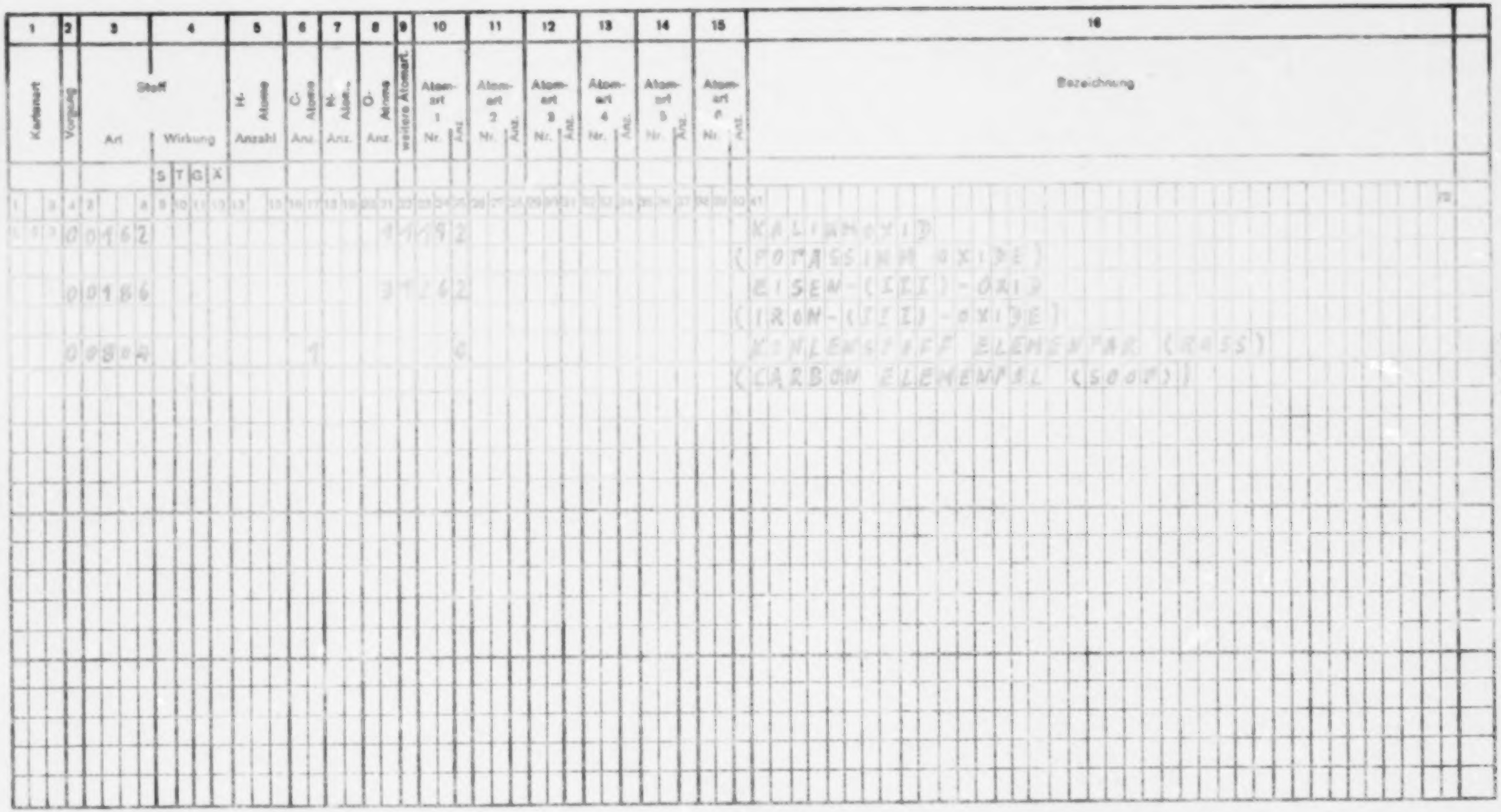

1	2	3	4	5	6	7	8	9	10		11		12		13		14		15		16
Kartenart	Vorgang	Stoff Art	Stoff Wirkung S T G X	H-Atome Anzahl	C-Atome Anz.	N-Atome Anz.	O-Atome Anz.	weitere Atomart.	Atomart 1 Nr.	Anz.	Atomart 2 Nr.	Anz.	Atomart 3 Nr.	Anz.	Atomart 4 Nr.	Anz.	Atomart 5 Nr.	Anz.	Atomart 6 Nr.	Anz.	Bezeichnung
[illegible]		00162					1	1	19	2											KALIUMOXID
																					(POTASSIUM OXIDE)
		00186					3	1	26	2											EISEN-(III)-OXID
																					(IRON-(III)-OXIDE)
		00804			1					0											KOHLENSTOFF ELEMENTAR (RUSS)
																					(CARBON ELEMENTAL (SOOT))

Erfassungsbeleg S, Stoffdaten ausgestellt am 5.6.69 von

Fig. 28: Completed coding form for the substance data file

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Stoffgruppendaten Grundkarte

1	2	3	4	5	6	7	8	9		10		11		12		
Kartenart	Vorgang	Stoff		Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente		2. Komponente		3. Komponente		4. Komponente		
		Art	Wirkung					Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	
			S T G Ä						%		%		%		%	
1 3	4	5 8	9 10 11 12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78	
5 0 4	0	8000		1	0	02	LUFT	96	79	97	21					

(AIR)

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16		
Karte Nr.	5. Komponente		6 Komponente		7. Komponente		8. Komponente		9 Komponente		10 Komponente		11. Komponente		12. Komponente		13 Komponente		14. Komponente		15 Komponente		
	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	
		%		%		%		%		%		%		%		%		%		%		%	
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79	
2																							

Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente		17. Komponente		18. Komponente		19. Komponente		20. Komponente	
	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil	Stoff Nr.	Anteil
		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von Ge

Fig. 29: Completed coding form for the substance data file

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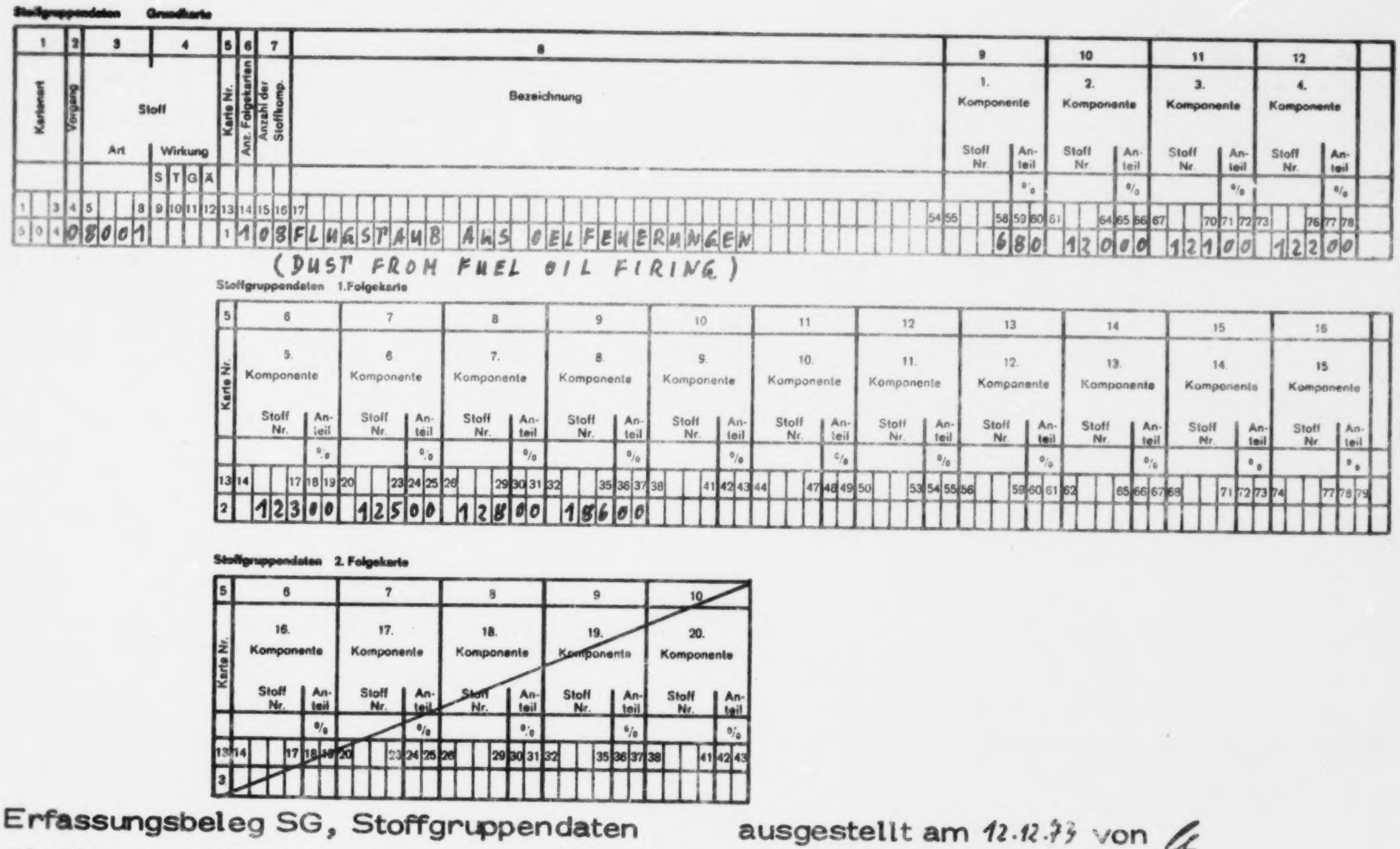


Stoffgruppendaten Grundkarte

1	2	3	4				5	6	7	8	9		10		11		12		
Kartenart	Vorgang	Stoff Art	Wirkung				Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr.	Anteil	2. Komponente Stoff Nr.	Anteil	3. Komponente Stoff Nr.	Anteil	4. Komponente Stoff Nr.	Anteil	
			S	T	G	Ä						%		%		%		%	
1 3	4	5 8	9	10	11	12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78	
5 0 4	0	8001					1	1	08	FLUGSTAUB AUS OELFEUERUNGEN	6	80	120	00	121	00	122	00	

(DUST FROM FUEL OIL FIRING)

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16		
Karte Nr.	5. Komponente Stoff Nr.	Anteil	6. Komponente Stoff Nr.	Anteil	7. Komponente Stoff Nr.	Anteil	8. Komponente Stoff Nr.	Anteil	9. Komponente Stoff Nr.	Anteil	10. Komponente Stoff Nr.	Anteil	11. Komponente Stoff Nr.	Anteil	12. Komponente Stoff Nr.	Anteil	13. Komponente Stoff Nr.	Anteil	14. Komponente Stoff Nr.	Anteil	15. Komponente Stoff Nr.	Anteil	
		%		%		%		%		%		%		%		%		%		%		%	
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79	
2	123	00	125	00	128	00	186	00															

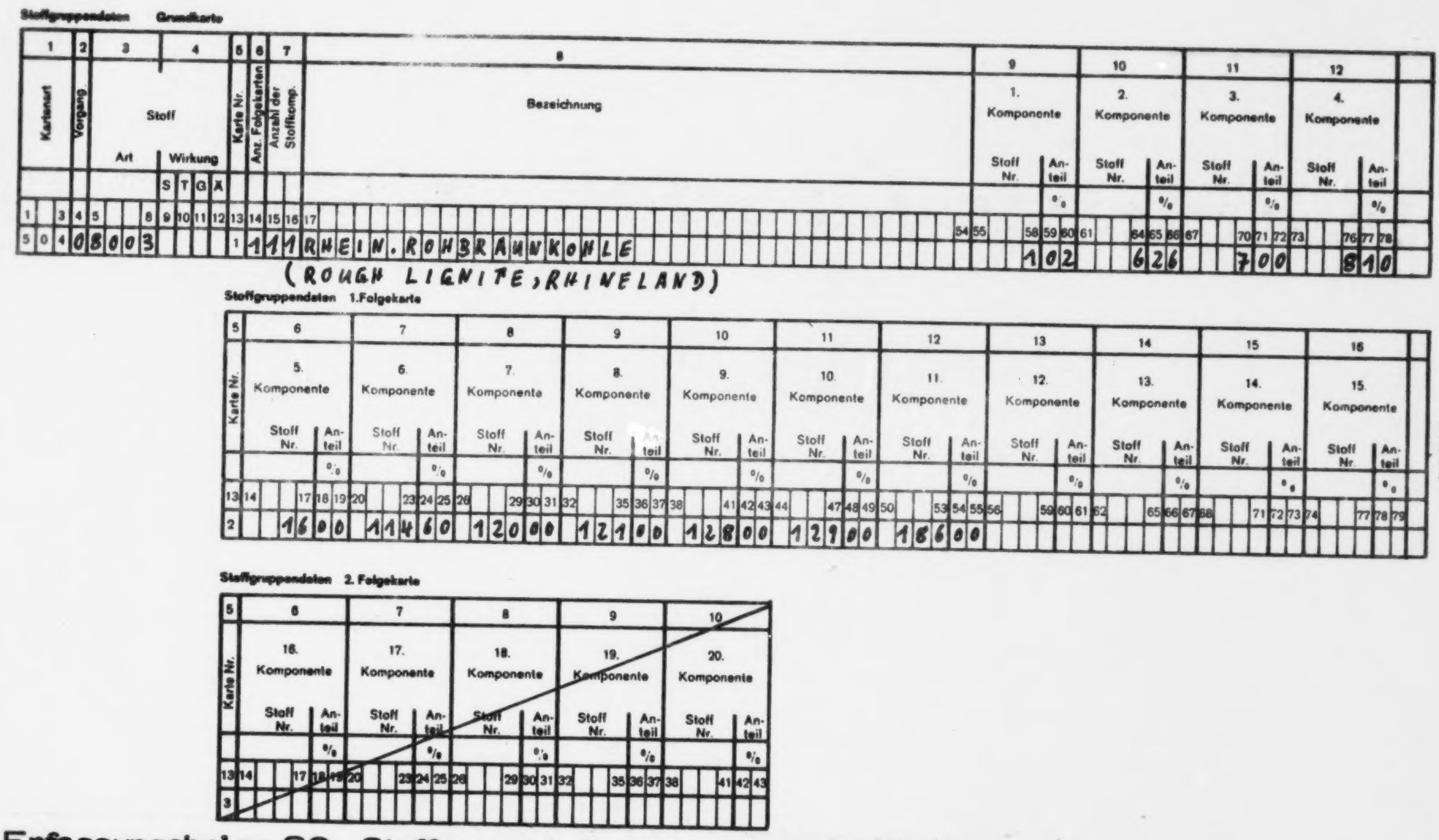
Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente Stoff Nr.	Anteil	17. Komponente Stoff Nr.	Anteil	18. Komponente Stoff Nr.	Anteil	19. Komponente Stoff Nr.	Anteil	20. Komponente Stoff Nr.	Anteil
		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von

Fig. 30: Completed coding form for the substance data file

3/108 7.72



Stoffgruppendaten Grundkarte

1	2	3	4	5	6	7	8	9		10		11		12		
Kartenart	Vorgang	Stoff Art	Stoff Wirkung S T G Ä	Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr.	An-teil %	2. Komponente Stoff Nr.	An-teil %	3. Komponente Stoff Nr.	An-teil %	4. Komponente Stoff Nr.	An-teil %	
1 3	4	5 8	9 10 11 12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78	
504	0	8003		1	1	11	RHEIN.ROHBRAUNKOHLE	1	02	6	26	7	00	8	10	

(ROUGH LIGNITE, RHINELAND)

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11	
Karte Nr.	5. Komponente Stoff Nr.	An-teil %	6. Komponente Stoff Nr.	An-teil %	7. Komponente Stoff Nr.	An-teil %	8. Komponente Stoff Nr.	An-teil %	9. Komponente Stoff Nr.	An-teil %	10. Komponente Stoff Nr.	An-teil %
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49
2	16	00	114	60	120	00	121	00	128	00	129	00

5	12		13		14		15		16		
Karte Nr.	11. Komponente Stoff Nr.	An-teil %	12. Komponente Stoff Nr.	An-teil %	13. Komponente Stoff Nr.	An-teil %	14. Komponente Stoff Nr.	An-teil %	15. Komponente Stoff Nr.	An-teil %	
13	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79	
2	186	00									

Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente Stoff Nr.	An-teil %	17. Komponente Stoff Nr.	An-teil %	18. Komponente Stoff Nr.	An-teil %	19. Komponente Stoff Nr.	An-teil %	20. Komponente Stoff Nr.	An-teil %
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von

Fig. 31: Completed coding form for the substance data file

3/108 7.72

Stoffgruppendaten Grundkarte

1	2	3	4	5	6	7	8	9		10		11		12		
Kartenart	Vorgang	Stoff Art	Stoff Wirkung	Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr.	An-teil	2. Komponente Stoff Nr.	An-teil	3. Komponente Stoff Nr.	An-teil	4. Komponente Stoff Nr.	An-teil	
			S T G X						%		%		%		%	
1 3	4	5 8	9 10 11 12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78	
5 0 4	0	8005		1	1	10	STEINKOHLE (PIT-COAL)	1		6		7		8		

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16		
Karte Nr.	5. Komponente Stoff Nr.	An-teil	6. Komponente Stoff Nr.	An-teil	7. Komponente Stoff Nr.	An-teil	8. Komponente Stoff Nr.	An-teil	9. Komponente Stoff Nr.	An-teil	10 Komponente Stoff Nr.	An-teil	11. Komponente Stoff Nr.	An-teil	12. Komponente Stoff Nr.	An-teil	13. Komponente Stoff Nr.	An-teil	14. Komponente Stoff Nr.	An-teil	15. Komponente Stoff Nr.	An-teil	
		%		%		%		%		%		%		%		%		%		%		%	
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79	
2	16		120		121		123		129		186												

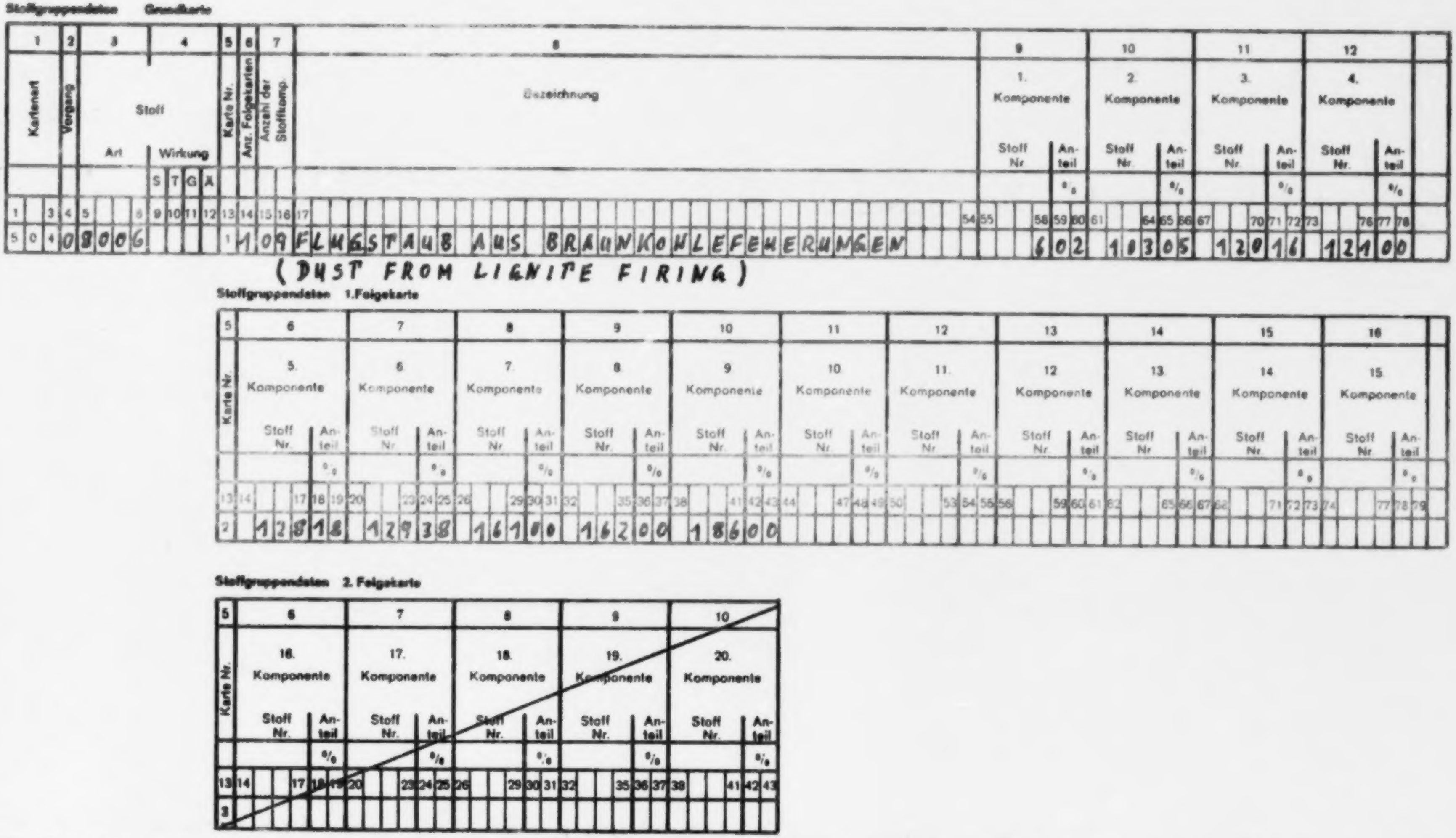
Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente Stoff Nr.	An-teil	17. Komponente Stoff Nr.	An-teil	18. Komponente Stoff Nr.	An-teil	19. Komponente Stoff Nr.	An-teil	20. Komponente Stoff Nr.	An-teil
		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von G

Fig. 32: Completed coding form for the substance data file

3/108 7.72



Stoffgruppendaten Grundkarte

1	2	3	4	5	6	7	8	9		10		11		12	
Kartenart	Vorgang	Stoff Art	Stoff Wirkung S T G Ä	Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr	An-teil %	2. Komponente Stoff Nr.	An-teil %	3. Komponente Stoff Nr.	An-teil %	4. Komponente Stoff Nr.	An-teil %
1 – 3	4	5 – 8	9 10 11 12	13	14	15 16	17 – 54	55 – 58	59 60	61 – 64	65 66	67 – 70	71 72	73 – 76	77 78
504	0	8006		1	1	09	FLUGSTAUB AUS BRAUNKOHLEFEUERUNGEN	6	02	103	05	120	16	121	00

(DUST FROM LIGNITE FIRING)

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16	
Karte Nr.	5. Komponente Stoff Nr.	An-teil %	6 Komponente Stoff Nr.	An-teil %	7. Komponente Stoff Nr.	An-teil %	8 Komponente Stoff Nr.	An-teil %	9 Komponente Stoff Nr.	An-teil %	10 Komponente Stoff Nr.	An-teil %	11. Komponente Stoff Nr.	An-teil %	12 Komponente Stoff Nr.	An-teil %	13. Komponente Stoff Nr.	An-teil %	14 Komponente Stoff Nr.	An-teil %	15 Komponente Stoff Nr.	An-teil %
13	14 – 17	18 19	20 – 23	24 25	26 – 29	30 31	32 – 35	36 37	38 – 41	42 43	44 – 47	48 49	50 – 53	54 55	56 – 59	60 61	62 – 65	66 67	68 – 71	72 73	74 – 77	78 79
2	128	18	129	38	161	00	162	00	186	00												

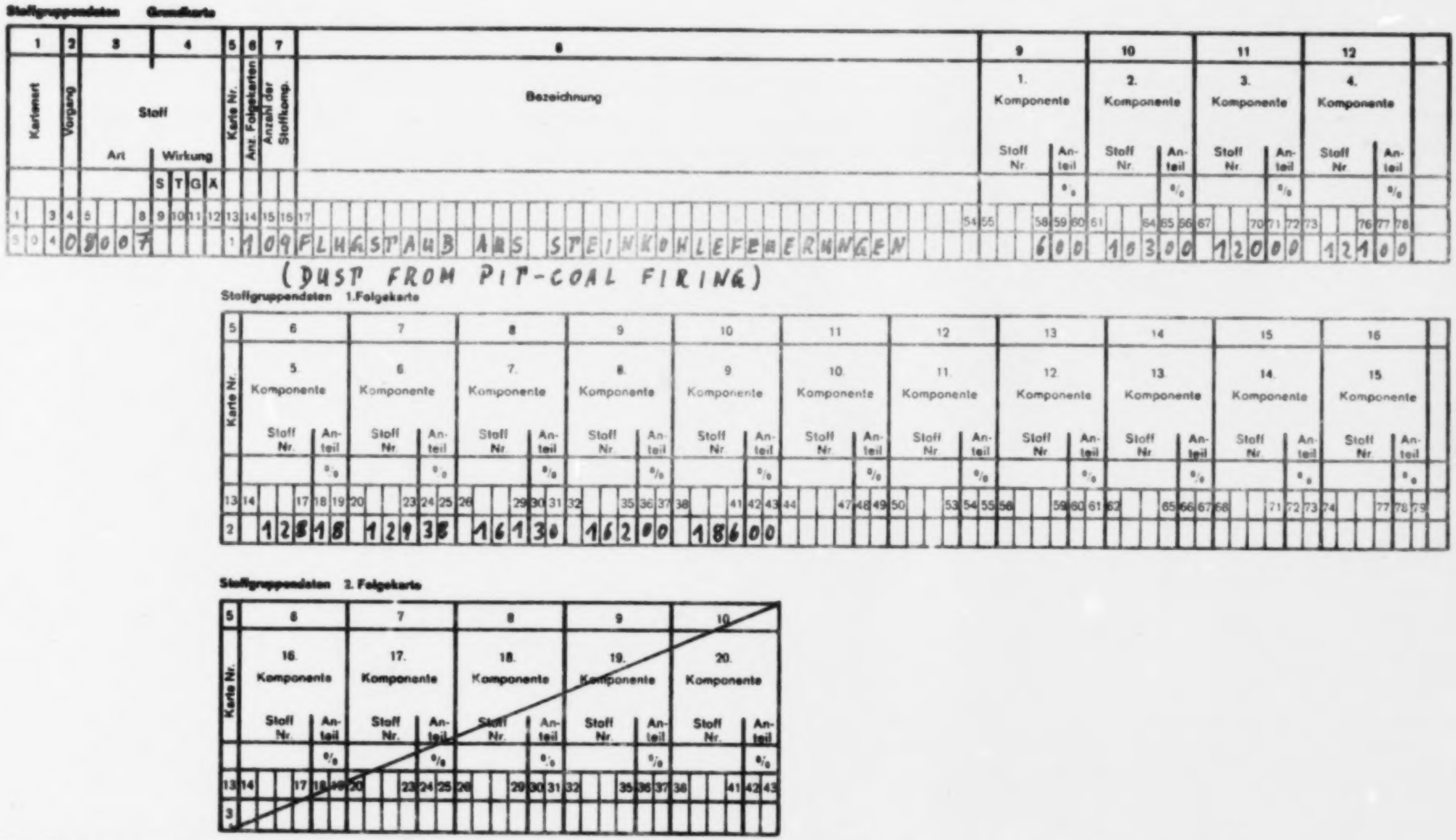
Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente Stoff Nr.	An-teil %	17. Komponente Stoff Nr.	An-teil %	18. Komponente Stoff Nr.	An-teil %	19. Komponente Stoff Nr.	An-teil %	20. Komponente Stoff Nr.	An-teil %
13	14 – 17	18 19	20 – 23	24 25	26 – 29	30 31	32 – 35	36 37	38 – 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von

Fig. 33: Completed coding form for the substance data file

3/108 7.72



Stoffgruppendaten Grundkarte

1	2	3	4	5	6	7	8	9		10		11		12	
Kartenart	Vorgang	Stoff		Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente		2. Komponente		3. Komponente		4. Komponente	
		Art	Wirkung S T G X					Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %
1 3	4	5 8	9 10 11 12	13	14	15 16	17 … 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78
5 0 4	0	8007		1	1	09	FLUGSTAUB AUS STEINKOHLEFEUERUNGEN	6	00	103	00	120	00	121	00

(DUST FROM PIT-COAL FIRING)

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16	
Karte Nr.	5. Komponente		6. Komponente		7. Komponente		8. Komponente		9 Komponente		10. Komponente		11. Komponente		12. Komponente		13. Komponente		14. Komponente		15. Komponente	
	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79
2	128	18	129	38	161	30	162	00	186	00												

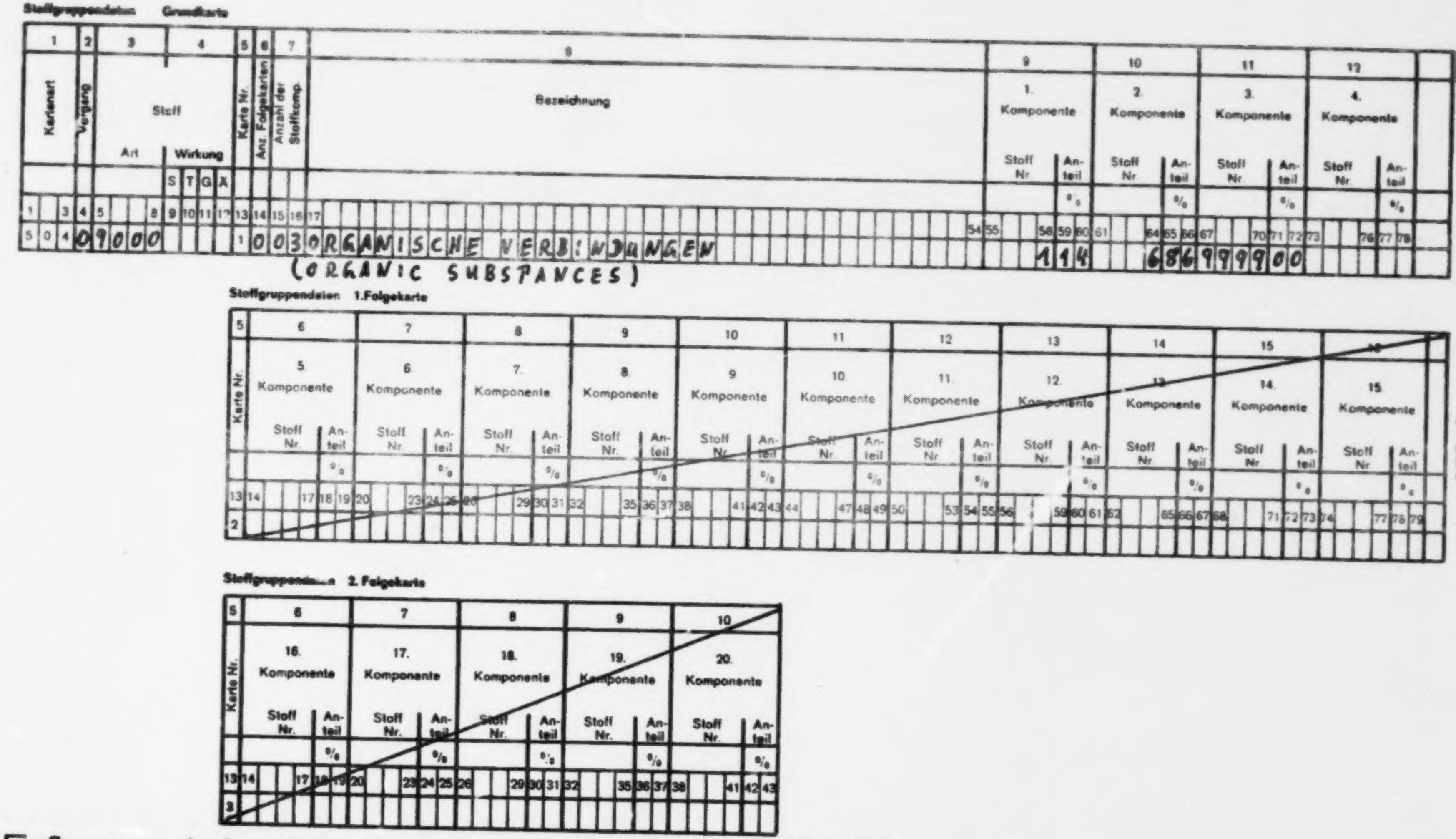
Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente		17. Komponente		18. Komponente		19. Komponente		20. Komponente	
	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %	Stoff Nr.	Anteil %
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von fl

Fig. 34: Completed coding form for the substance data file

3/106 7.72



Stoffgruppendaten Grundkarte

1	2	3	4	5	6	7	8	9	10	11	12
Kartenart	Vorgang	Stoff Art	Stoff Wirkung S T G Ä	Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr. / Anteil %	2. Komponente Stoff Nr. / Anteil %	3. Komponente Stoff Nr. / Anteil %	4. Komponente Stoff Nr. / Anteil %
1–3	4	5–8	9 10 11 12	13	14	15 16	17–54	55–58 / 59 60	61–64 / 65 66	67–70 / 71 72	73–76 / 77 78
5 0	4	0 9 0 0 0		1	0	0 3	0 ORGANISCHE VERBINDUNGEN	1 1 4	6 8 6	9 9 9 9 / 0 0	

(ORGANIC SUBSTANCES)

Stoffgruppendaten 1.Folgekarte

5	6	7	8	9	10	11	12	13	14	15	16
Karte Nr.	5. Komponente Stoff Nr. / Anteil %	6. Komponente Stoff Nr. / Anteil %	7. Komponente Stoff Nr. / Anteil %	8. Komponente Stoff Nr. / Anteil %	9 Komponente Stoff Nr. / Anteil %	10. Komponente Stoff Nr. / Anteil %	11. Komponente Stoff Nr. / Anteil %	12. Komponente Stoff Nr. / Anteil %	13. Komponente Stoff Nr. / Anteil %	14. Komponente Stoff Nr. / Anteil %	15. Komponente Stoff Nr. / Anteil %
13	14–17 / 18 19	20–23 / 24 25	26–29 / 30 31	32–35 / 36 37	38–41 / 42 43	44–47 / 48 49	50–53 / 54 55	56–59 / 60 61	62–65 / 66 67	68–71 / 72 73	74–77 / 78 79
2											

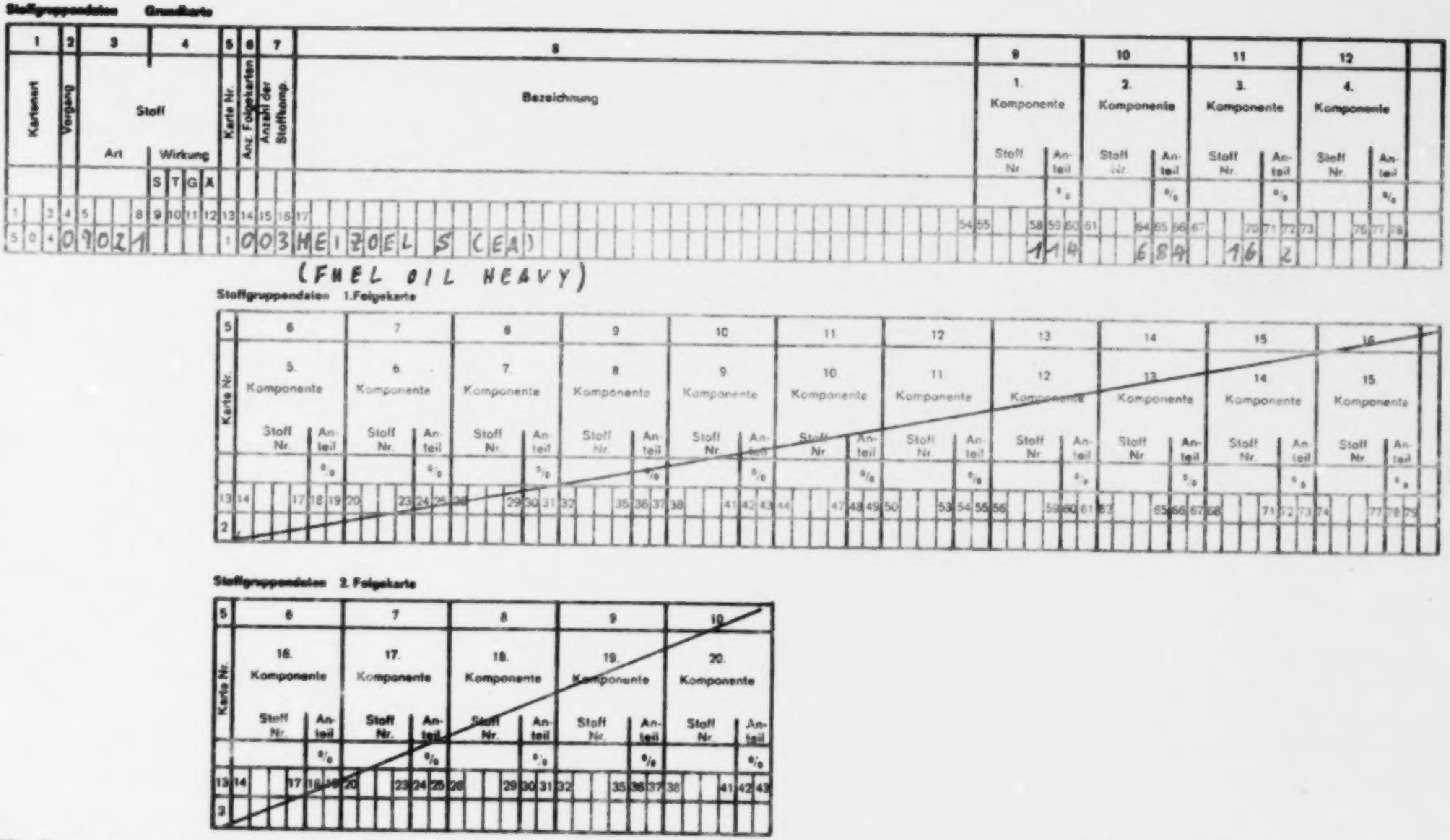
Stoffgruppendaten 2. Folgekarte

5	6	7	8	9	10
Karte Nr.	16. Komponente Stoff Nr. / Anteil %	17. Komponente Stoff Nr. / Anteil %	18. Komponente Stoff Nr. / Anteil %	19. Komponente Stoff Nr. / Anteil %	20. Komponente Stoff Nr. / Anteil %
13	14–17 / 18 19	20–23 / 24 25	26–29 / 30 31	32–35 / 36 37	38–41 / 42 43
3					

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von Ge

Fig. 35: Completed coding form for the substance data file

3/108 7.72



Stoffgruppendaten Grundkarte

1	2	3	4				5	6	7	8	9		10		11		12		
Kartenart	Vorgang	Stoff Art	Stoff Wirkung				Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr.	An-teil	2. Komponente Stoff Nr.	An-teil	3. Komponente Stoff Nr.	An-teil	4. Komponente Stoff Nr.	An-teil	
			S	T	G	A						%		%		%		%	
1 3	4	5 8	9	10	11	12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78	
5 0 4	0	9021					1	0	03	HEIZOEL S (EA)	1	14	6	84	16	2			

(FUEL OIL HEAVY)

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16
Karte Nr.	5. Komponente Stoff Nr.	An-teil	6. Komponente Stoff Nr.	An-teil	7. Komponente Stoff Nr.	An-teil	8. Komponente Stoff Nr.	An-teil	9. Komponente Stoff Nr.	An-teil	10. Komponente Stoff Nr.	An-teil	11. Komponente Stoff Nr.	An-teil	12. Komponente Stoff Nr.	An-teil	13. Komponente Stoff Nr.	An-teil	14. Komponente Stoff Nr.	An-teil	15. Komponente Stoff Nr.	An-teil
		%		%		%		%		%		%		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79
2																						

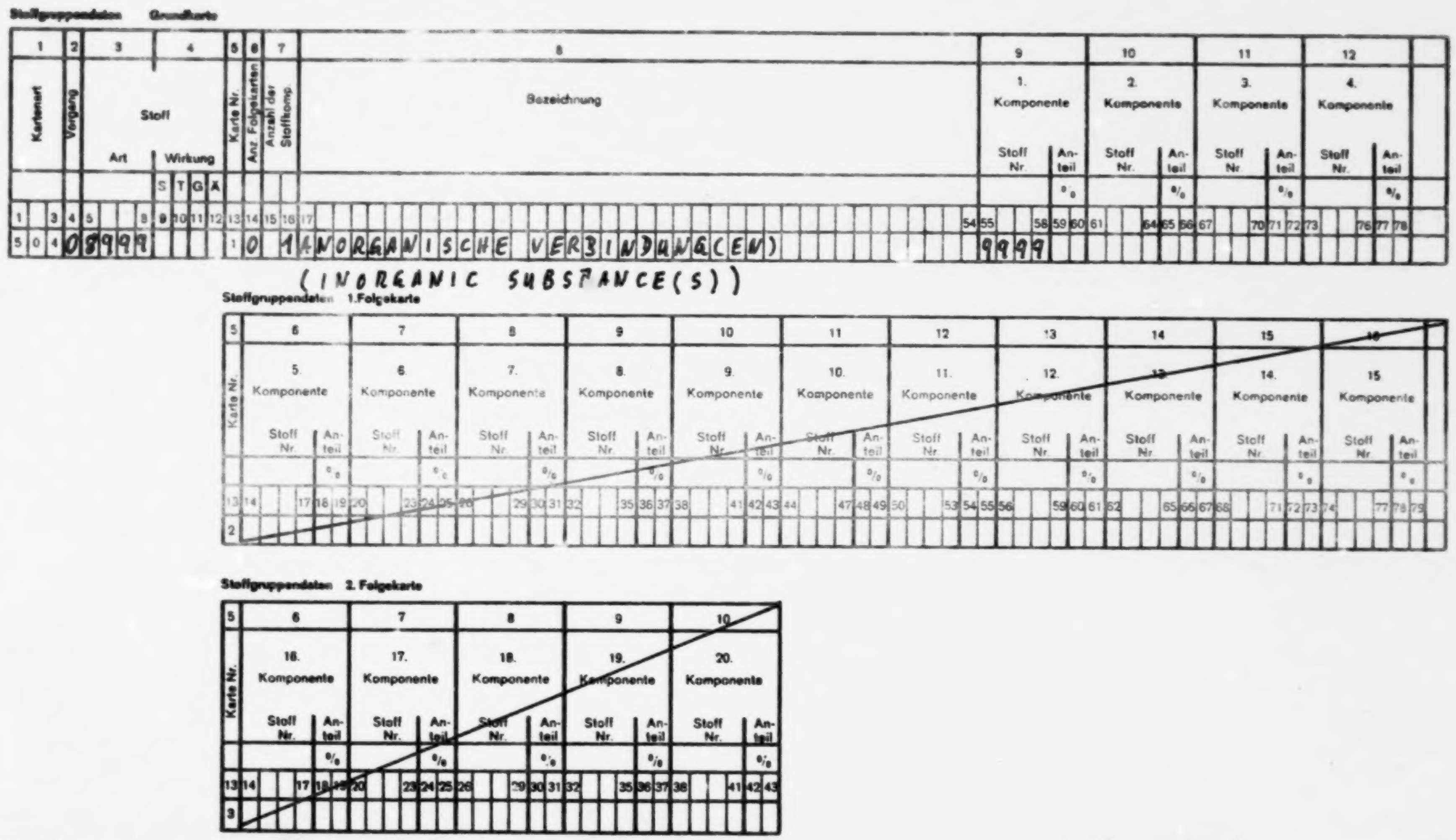
Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente Stoff Nr.	An-teil	17. Komponente Stoff Nr.	An-teil	18. Komponente Stoff Nr.	An-teil	19. Komponente Stoff Nr.	An-teil	20. Komponente Stoff Nr.	An-teil
		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von

Fig. 36: Completed coding form for the substance data file

3/108 7.72



Stoffgruppendaten Grundkarte

1	2	3	4				5	6	7	8	9		10		11		12		
Kartenart	Vorgang	Stoff Art	Stoff Wirkung				Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr.	An-teil	2. Komponente Stoff Nr.	An-teil	3. Komponente Stoff Nr.	An-teil	4. Komponente Stoff Nr.	An-teil	
			S	T	G	Ä						%		%		%		%	
1 3	4	5 8	9	10	11	12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78	
5 0 4	0	8999					1	0	1	ANORGANISCHE VERBINDUNG(EN) (INORGANIC SUBSTANCE(S))	9999								

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16	
Karte Nr.	5. Komponente Stoff Nr.	An-teil	6. Komponente Stoff Nr.	An-teil	7. Komponente Stoff Nr.	An-teil	8. Komponente Stoff Nr.	An-teil	9. Komponente Stoff Nr.	An-teil	10. Komponente Stoff Nr.	An-teil	11. Komponente Stoff Nr.	An-teil	12. Komponente Stoff Nr.	An-teil	13. Komponente Stoff Nr.	An-teil	14. Komponente Stoff Nr.	An-teil	15 Komponente Stoff Nr.	An-teil
		%		%		%		%		%		%		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79
2																						

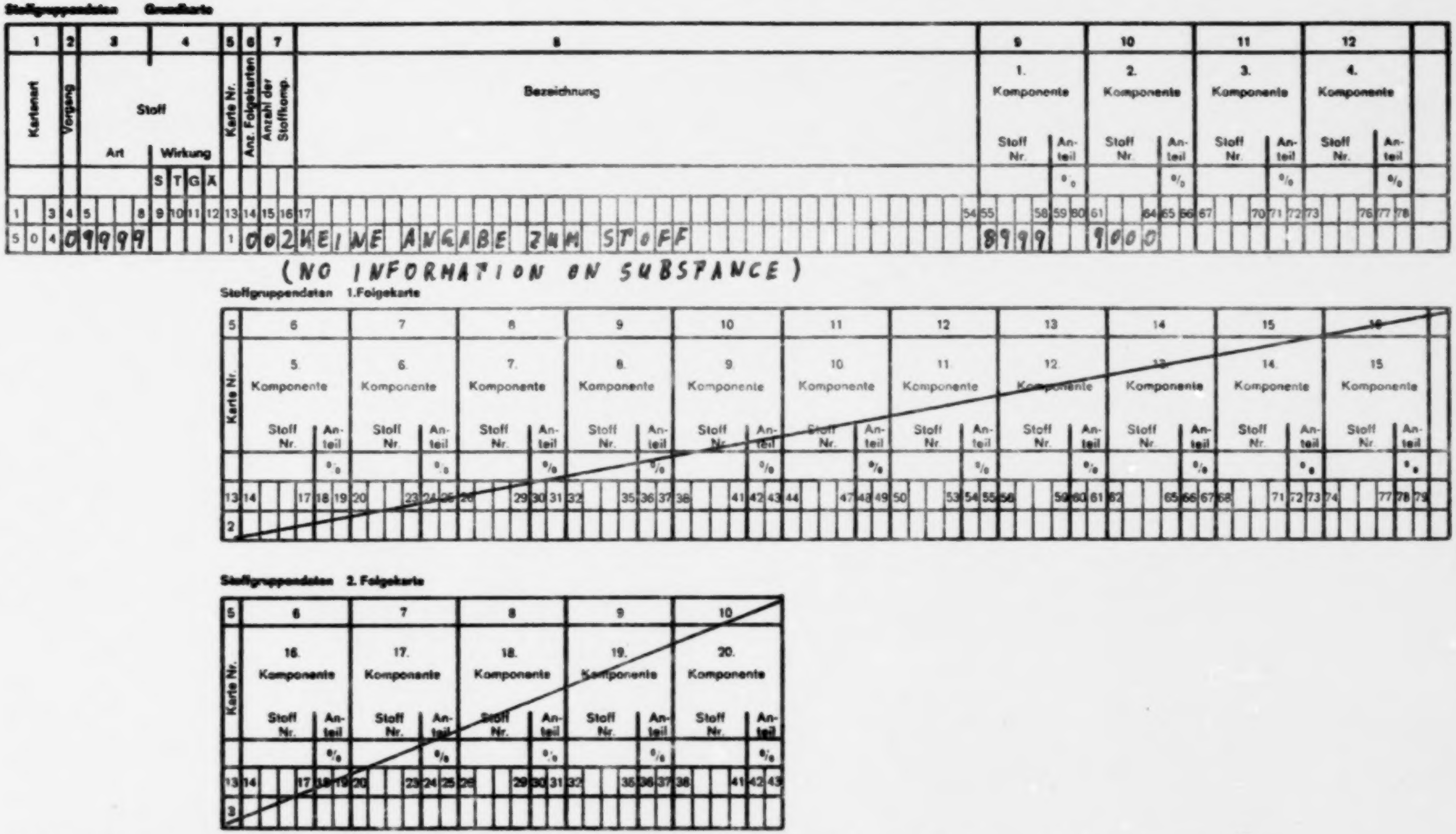
Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente Stoff Nr.	An-teil	17. Komponente Stoff Nr.	An-teil	18. Komponente Stoff Nr.	An-teil	19. Komponente Stoff Nr.	An-teil	20. Komponente Stoff Nr.	An-teil
		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von

Fig. 37: Completed coding form for the substance data file

3/108 7.72



Stoffgruppendaten Grundkarte

1	2	3	4	5	6	7	8	9		10		11		12	
Kartenart	Vorgang	Stoff Art	Stoff Wirkung	Karte Nr.	Anz. Folgekarten	Anzahl der Stoffkomp.	Bezeichnung	1. Komponente Stoff Nr.	An-teil	2. Komponente Stoff Nr.	An-teil	3. Komponente Stoff Nr.	An-teil	4. Komponente Stoff Nr.	An-teil
			S T G Ä						%		%		%		%
1 3	4	5 8	9 10 11 12	13	14	15 16	17 54	55 58	59 60	61 64	65 66	67 70	71 72	73 76	77 78
5 0 4	0	9999		1	0	02	KEINE ANGABE ZUM STOFF	8999		9000					

(NO INFORMATION ON SUBSTANCE)

Stoffgruppendaten 1.Folgekarte

5	6		7		8		9		10		11		12		13		14		15		16	
Karte Nr.	5. Komponente Stoff Nr.	An-teil	6. Komponente Stoff Nr.	An-teil	7. Komponente Stoff Nr.	An-teil	8. Komponente Stoff Nr.	An-teil	9. Komponente Stoff Nr.	An-teil	10. Komponente Stoff Nr.	An-teil	11. Komponente Stoff Nr.	An-teil	12. Komponente Stoff Nr.	An-teil	13. Komponente Stoff Nr.	An-teil	14. Komponente Stoff Nr.	An-teil	15 Komponente Stoff Nr.	An-teil
		%		%		%		%		%		%		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43	44 47	48 49	50 53	54 55	56 59	60 61	62 65	66 67	68 71	72 73	74 77	78 79
2																						

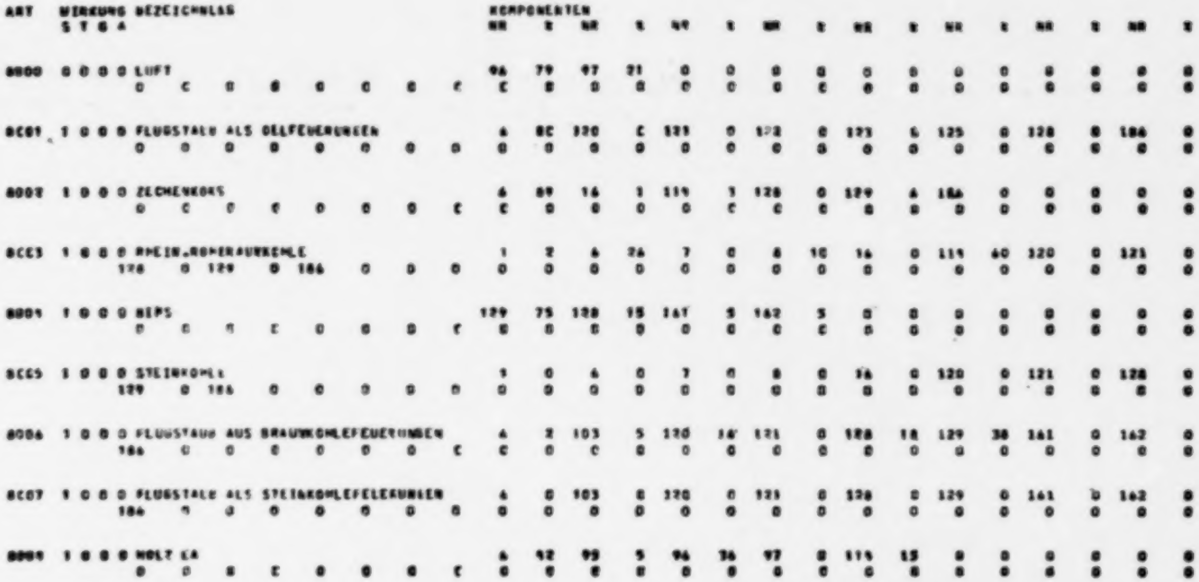
Stoffgruppendaten 2. Folgekarte

5	6		7		8		9		10	
Karte Nr.	16. Komponente Stoff Nr.	An-teil	17. Komponente Stoff Nr.	An-teil	18. Komponente Stoff Nr.	An-teil	19. Komponente Stoff Nr.	An-teil	20. Komponente Stoff Nr.	An-teil
		%		%		%		%		%
13	14 17	18 19	20 23	24 25	26 29	30 31	32 35	36 37	38 41	42 43
3										

Erfassungsbeleg SG, Stoffgruppendaten ausgestellt am 12.12.73 von

Fig. 38: Completed coding form for the substance data file

3/106 7.72



```
ART   WIRKUNG BEZEICHNUNG                     KOMPONENTEN
      S T G A                                 NR   %   NR   %   NR   %   NR   %   NR   %   NR   %   NR   %   NR   %

0000  0 0 0 0 LUFT                            96  79   97  21    0   0    0   0    0   0    0   0    0   0    0   0
              0   0   0   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0001  1 0 0 0 FLUGSTAUB ALS OELFEUERUNGEN      4  80  120   0  121   0  122   0  123   6  125   0  128   0  186   0
              0   0   0   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0002  1 0 0 0 ZECHENKOKS                       4  89   16   1  119   3  120   0  129   4  186   0    0   0    0   0
              0   0   0   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0003  1 0 0 0 RHEIN.ROHBRAUNKOHLE              1   2    4  26    7   0    8  10   16   0  119  40  120   0  121   0
            128   0 129   0 186   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0004  1 0 0 0 REPS                           129  75  128  15  141   5  142   5    0   0    0   0    0   0    0   0
              0   0   0   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0005  1 0 0 0 STEINKOHLE                       1   0    4   0    7   0    8   0   16   0  120   0  121   0  128   0
            129   0 186   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0006  1 0 0 0 FLUGSTAUB AUS BRAUNKOHLEFEUERUNGEN  4   2  103   5  120  14  121   0  128  18  129  38  141   0  142   0
            186   0   0   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0007  1 0 0 0 FLUGSTAUB ALS STEINKOHLEFEUERUNGEN  4   0  103   0  120   0  121   0  128   0  129   0  141   0  142   0
            186   0   0   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0

0009  1 0 0 0 HOLZ EA                          4  92   95   5   96  36   97   0  119  15    0   0    0   0    0   0
              0   0   0   0   0   0   0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0
```

Fig. 39: Example for a printout of the substance data file, nummerically sorted

```
NR.     BEZEICHNUNG                              SUMMENFORMEL

0014    SILICIUM                                 SI1
0191    CALCIUMCHLORID                           CL2-CA1
0196    BARIUMCHLORID                            CL2-BA1
0022    TITAN                                    TI1
0024    CHROM                                    CR1
0025    MANGAN                                   MN1
0026    EISEN                                    FE1
0028    NICKEL                                   NI1
0029    KUPFER                                   CU1
0050    ZINN                                     SN1
0082    BLEI                                     PB1
0121    MAGNESIUMOXID                            O1-MG1
0109    NATRIUMPHOSPHAT                          O4-NA3-P1
0105    PHOSPHOR-(V)-OXID                        O5-P2
0130    NATRIUMNITRIT                            N1-O2-NA1
0096    STICKSTOFF MOLEKULAR                     N2
0192    NATRIUMPERCARBONAT                       C1-O3-NA2
1368    PERCHLORAETHYLEN                         C2-CL4
0127    NATRIUMHYDROXID                          H1-O1-NA1
0137    SALPETERSAEURE                           H1-N1-O3
1072    TRICHLORAETHYLEN                         H1-C2-CL3
0114    WASSER                                   H2-O1
1263    DICHLORMETHAN(METHYLENCHLORID)           H2-C1-CL2
1357    ACETYLEN                                 H2-C2
0110    AMMONIAK                                 H3-N1
1328    VINYLCHLORID (POLYMER)                   H3-C2-CL1
1091    CHLORESSIGSAEURE                         H3-C2-O2-CL1
1337    EPICHLORHYDRIN                           H5-C3-O1-CL1
1172    CHLOROPREN (POLYMER)                     H5-C4-CL1
1006    GLYKOL                                   H6-C2-O2
1044    BUTADIEN (POLYMER)                       H6-C4
1043    PHENOL                                   H6-C6-O1
1079    PHTHALSAEURE                             H6-C8-O4
1002    PROPAN                                   H8-C3
1198    GLYCERIN                                 H8-C3-O3
1397    ISOBUTEN (POLYMER)                       H8-C4
1209    AETHYLACETAT                             H8-C4-O2
1145    STYROL (POLYMER)                         H8-C8
1205    ADIPINSAEURE                             H10-C6-O4
1257    POLYGLUCOSE (CELLULOSE)                  H10-C6-O5
1008    XYLOL(DIMETHYL[illegible]ZOL)                   H10-C8
1078    2-METHYLPENTAN[illegible]OL)                    H12-C6-O1
1332    BUTYLACETAT                              H12-C6-O2
1390    CETAN(PARAFFIN)                          H34-C16
1210    POLYURETHAN AUS 2X1205 +1X1181           H35-C27-N2-O10
```

Fig. 40: Example for a printout of the substance data file, formula-sorted

Addendum V: List of plant standards and examples of investigations via the collective approach - space heatings, filling stations and traffic

1. List of plant standards

2. Examples for domestic heating and minor industry

2.1 Space heating
2.2 Filling stations

3. Example for street traffic

1. List of plant standards

The following tables show the actually available plant standards as well as the emitted substances under investigation.

Table 1 includes domestic heating data subdivided according to type of use and fuel burnt. The entered figures are the type of plant code numbers. Table 2 contains all other plant standards.

2. Examples for domestic heating and minor industry

2.1 Domestic heating

As already mentioned in chapter 3.2.1 the data collection itself (2. stage) in Germany is made by the chimney sweepers. They have detailed lists of all heating installations. This is valid only for buildings provided with central heating installations. In appartments provided with individual heatings only their existence is known but not their fuels used - gas, coal or oil - or their capacities. The latter mentioned installations are described by two plant standards (ref. Table 1, plant type 340 and 350). Their basic data are related to the individual chimney and floor. The basic data - capacity and fuel composition - are evaluated by statistically selected questioning in each heavy load area. The emissions are then calculated on the basis of average data on capacity and fuel composition per chimney and floor. The remaining procedure is identical with the procedure for central heating installations.

Figure 1 serves as an example of data investigations by the chimney sweepers. The resulting plants are outlined in Table 3. The plant numbers refer to the standard plant code number as given in Table 1.

Table 1: Plant standards for domestic heating

use	fuel*)			emitted substances					
	gas	oil	coal	SO_2	CO	NO_x (NO_2)	organic gases	dust	F^- **)
Residential home	040	010	050	x	x	x	x	x	x
Office buildings	041	011	051	x	x	x	x	x	x
Mixed use buildings	042	012	052	x	x	x	x	x	x
Market gardens	045	015	055	x	x	x	x	x	x
Industrial trade establishment	046	016	056	x	x	x	x	x	x
Other buildings	047	017	057	x	x	x	x	x	x
Production/ heat generation	049	019	059	x	x	x	x	x	x
Chimneys with single or multi room ovens	340	340	340	x	x	x	x	x	x
	350	-	-	x	x	x	x	x	-

*) code-Nos. of the plant

**) only for coal-fired plants

Table 2: List of all existing plant standards, except for domestic heating

use	fuel/working substance(s)	emitted substances								code Nos. operator/plant
		SO_2	CO	NO_2	organic gases	dust	F^-	Cl^-	otner substances	
Lignite firing	lignite									
- 1-shift operation		x	x	x	x	x	x	x		90002/001
- 2-shift operation		x	x	x	x	x	x	x		/002
- 3-shift operation		x	x	x	x	x	x	x		/003
Hardcoal firing	coal									
- 1-shift operation		x	x	x	x	x	x	x	Aldehyde	90002/011
- 2-shift operation		x	x	x	x	x	x	x	Aldehyde	/012
- 3-shift operation		x	x	x	x	x	x	x	Aldehyde	/013
Oil firing	oil									
- 1-shift operation		x	x	x	x	x				90002/021
- 2-shift operation		x	x	x	x	x				/022
- 3-shift operation		x	x	x	x	x				/023

Table 2: Continuation

use	fuel/working substance(s)	emitted substances								code Nos. operator/plant
		SO_2	CO	NO_2	organic gases	dust	F^-	Cl^-	other substances	
Heavy oil "S" firing	heavy oil "S"									
- 1-shift operation		x	x	x	x	x				90002/031
- 2-shift operation		x	x	x	x	x				/032
- 3-shift operation		x	x	x	x	x				/033
Gas firing	gas									
- 1-shift operation		x	x	x	x	x				90002/41
- 2-shift operation		x	x	x	x	x				/42
- 3-shift operation		x	x	x	x	x				/43
Baker's shop										
- oven, average	oil, gas	x	x	x	x	x				90010/001
- oven	oil	x	x	x	x	x				/010
- oven	gas	x	x	x	x	x				/011
Butcher's shop, average	oil, gas, coal	x	x	x	x	x	x	x	Aldehyde Methane Ethane	90011/001

Table 2: Continuation

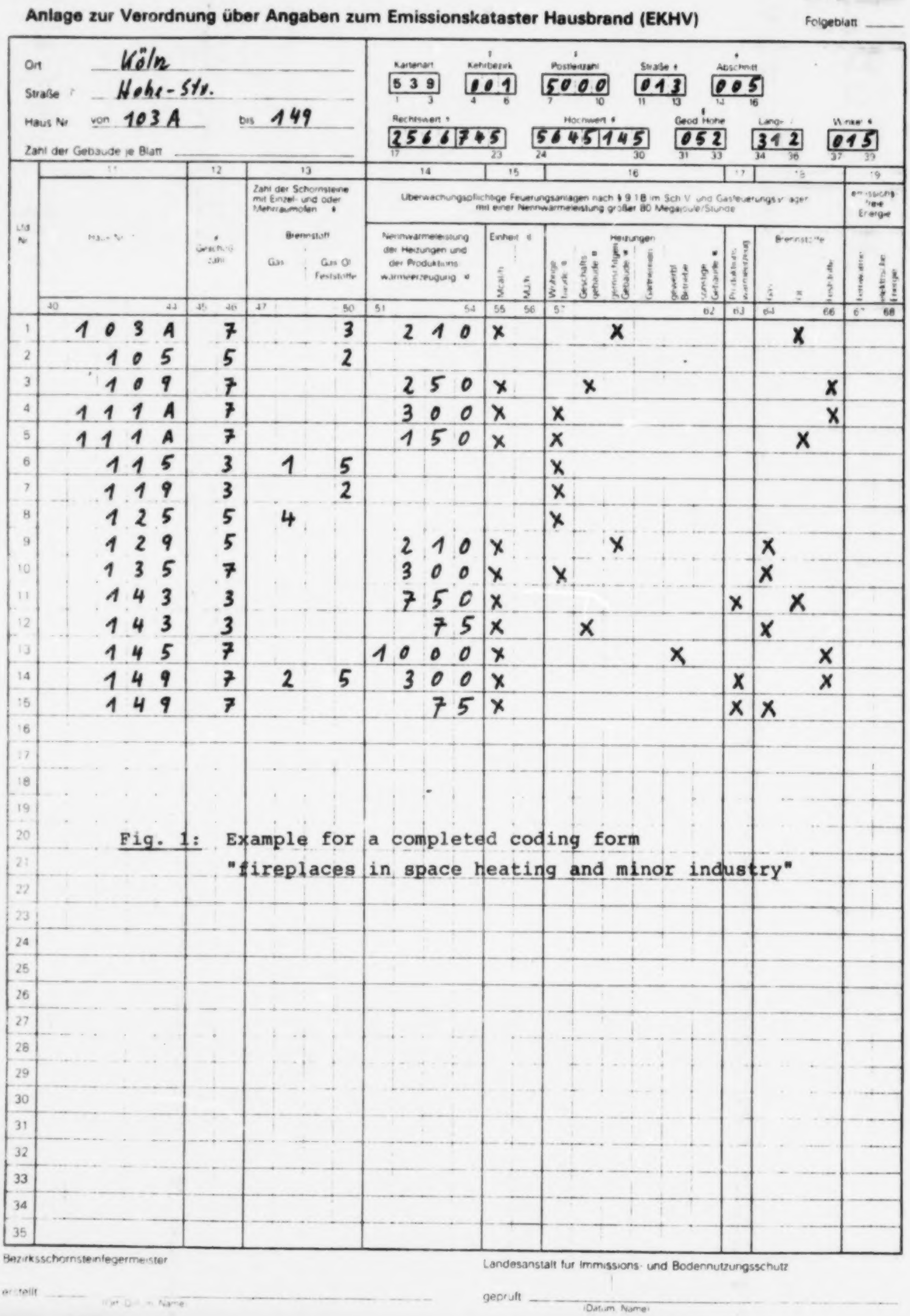
use	fuel/working substance(s)	emitted substances								code Nos. operator/plant
		SO_2	CO	NO_2	organic gases	dust	F^-	Cl^-	other substances	
Smoke house										
- cold smoke	wood	x	x	x	x				Methane Ethane	90011/040
- hot smoke	wood	x	x	x	x				Methane Ethane	/140
Sausage boiler										
- coal firing	coal	x	x	x	x	x	x	x	Aldehyde	90011/210
- oil firing	oil	x	x	x	x	x			Aldehyde	/220
- gas firing	gas	x	x	x	x	x				/230
Laundry										
- oil firing	oil	x	x	x	x	x			Aldehyde	90012/10
- coal firing	coal	x	x	x	x	x	x	x	Aldehyde	/30
- gas firing	gas	x	x	x	x	x				/40

Table 2: Continuation

use	fuel/working substance(s)	emitted substances								code Nos. operator/plant
		SO_2	CO	NO_2	organic gases	dust	F^-	Cl^-	other substances	
Dry cleaning	Trichloro-, Tetrachloroethyline								Trichloro-, Tetrachloroethyline	90013/010
Filling station										
- on an average	gasoline, gas oil				x					90014/001
- turnover up to 500 m³	gasoline, gas oil				x					/025
- turnover from 501 to 1000 m³	gasoline, gas oil				x					/075
- turnover from 1001 to 2000 m³	gasoline, gas oil				x					/150
- turnover more than 2000 m³	gasoline, gas oil				x					/300
- fuel oil	gas oil				x					/400

Table 2: Continuation

use	fuel/working substance(s)	emitted substances								code Nos. operator/plant
		SO_2	CO	NO_2	organic gases	dust	F^-	Cl^-	other substances	
Church										
- oil firing	oil	x	x	x	x	x			Aldehyde	90015/010
- coal firing	coal	x	x	x	x	x	x	x	Aldehyde	/030
- gas firing	gas	x	x	x	x	x				/040
Joiner's workshop										
- incinerator	wood	x	x	x	x	x			Methane Ethane	90016/001
Waste incinerator										
- domestic waste	cil, refuse	x	x	x	x	x	x	x		90019/011
- hospital waste	oil, refuse	x	x	x	x	x	x	x		/012
- paper waste	oil, paper	x	x	x	x	x		x		/013
Coffee-roasters	gas, organic substances	x	x	x	x	x			Acetone Acet-aldehyde	90019/021



Blatt Nr ______

Anlage zur Verordnung über Angaben zum Emissionskataster Hausbrand (EKHV)

Folgeblatt ______

Ort Köln

Straße Hohe-Str.

Haus Nr von 103 A bis 149

Zahl der Gebäude je Blatt ______

Kartenart (1–3)	Kehrbezirk (4–6)	Postleitzahl (7–10)	Straße (11–13)	Abschnitt (14–16)
539	001	5000	013	005

Rechtswert (17–23)	Hochwert (24–30)	Geod Höhe (31–33)	Länge (34–36)	Winkel (37–39)
2566745	5645145	052	312	015

Lfd Nr	11	12	13	13	14	15	15	16	16	16	16	16	16	17	18	18	18	19	19
			Zahl der Schornsteine mit Einzel- und oder Mehrraumöfen		Überwachungspflichtige Feuerungsanlagen nach § 9.1 B im Sch V. und Gasfeuerungsanlagen mit einer Nennwärmeleistung größer 80 Megajoule/Stunde													emissionsfreie Energie	
	Haus-Nr.	Geschoßzahl	Brennstoff Gas	Brennstoff Gas Öl Feststoffe	Nennwärmeleistung der Heizungen und der Produktionswärmeerzeugung	Einheit Mcal/h	Einheit MJ/h	Heizungen Wohngebäude	Geschäftsgebäude	gemischtgenutzte Gebäude	Gaststätten	gewerbl. Betriebe	sonstige Gebäude	Produktionswärmeerzeugung	Brennstoffe Gas	Öl	Feststoffe	Fernwärme	elektrische Energie
	40–43	45–46	47	50	51–54	55	56	57					62	63	64		66	67	68
1	103 A	7		3	210	X				X						X			
2	105	5		2															
3	109	7			250	X			X								X		
4	111 A	7			300	X		X									X		
5	111 A	7			150	X		X								X			
6	115	3	1	5				X											
7	119	3		2				X											
8	125	5	4					X											
9	129	5			210	X				X					X				
10	135	7			300	X		X							X				
11	143	3			750	X								X		X			
12	143	3			75	X			X						X				
13	145	7			1000	X						X					X		
14	149	7	2	5	300	X								X			X		
15	149	7			75	X								X	X				
16																			
17																			
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32																			
33																			
34																			
35																			

Bezirksschornsteinfegermeister

erstellt ______ (Ort, Datum, Name)

Landesanstalt für Immissions- und Bodennutzungsschutz

geprüft ______ (Datum, Name)

Fig. 1: Example for a completed coding form "fireplaces in space heating and minor industry"

Table 3: Listing of plant type, number and capacity in accordance with the data given in Fig. 1

house No.	plant typ	number	capacity (Mcal/hr)
103 A	012	1	210
103 A	340	3	*)
105	340	2	*)
109	051	1	250
111 A	050	1	300
111 A	010	1	150
115 A	350	1	*)
115 A	340	5	*)
119	350	2	*)
125	340	4	*)
129	042	1	210
135	040	1	300
143	019	1	750
143	041	1	75
145	056	1	1000
149	350	2	*)
149	340	5	*)
149	59	1	300
149	049	1	75

*) The capacity is evaluated on the basis of statistically selected questioning.

The plant standards are defined in the same manner by means of an emissions' analysis as is done in the individual approach (ref. Addendum IV). The result of such an emissions' analysis is outlined in Table 4 for plant standard number 012 "Oil central heating in mixed used buildings". Table 5 refers to the plant standard 052 "Coal heating in mixed used buildings". The tables display the division of firing capacities in different months of the year and different hours of the days of the week; these are the main criteria for the emission data based on the annual fuel needs. This division is done following the average temperatures of the single months as well as the living habits of men. The emissions themselves are calculated using emission factors and the corresponding capacities.

2.2 Minor industry

The data collection for minor industry is outlined in an example of a filling station. The evaluation of the basic data can be made via the corresponding questionnaire forms T as given in Addendum III. The data transfer into the data file is outlined in Figs. 2 and 3 (questionnaire forms) and Fig. 4 (coding form for minor industry).

As can be seen from Table 2 filling stations are described by 7 plant standards. The overall annual emission data could be described by one standard, only, however a more detailed description of the time dependence (resolution) of the emissions requires a further division. Another standard was derived as an average of all standards in order to be able to include also such plants for which the location only, is indicated (ref. questionnaire form in Fig. 2).

The development of a plant standard is outlined in detail as follows (example: filling station):

Table 4: Oil central heating in mixed used buildings (residential and shop buildings). The figures reflect the operation of the burners in minutes per hour.

frequency/ duration	month	day	Time				
			hour				
			$5^{00}-6^{00}$	$6^{00}-8^{00}$	$8^{00}-11^{00}$	$11^{00}-22^{00}$	$22^{00}-5^{00}$
once per hour for x minutes	January	Mo.-Fr. Saturday Sunday	25	47 41 33	31 24	27	20
	February	"	22	42 35 29	27 22	23	17
	March	"	20	31 27 23	26 20	18	15
	April	"	16	22 20 16	19 15	11	11
	May	"	4	5 5 4	4 3	3	3
	June	"	-	-	-	-	-
	July	"	-	-	-	-	-
	August	"	-	-	-	-	-
	September	"	3	4 3 3	3 2	2	2
	October	"	14	20 18 15	17 12	10	10
	November	"	20	34 29 24	24 18	18	14
	December	"	22	43 35 29	26 20	23	15
5 times/day for x minutes	January to December	Monday to Sunday	-	2			

Table 5: Coal central heating in mixed used buldings (residential and shop buildings). The Figures reflect the firing capacity as percentages of the nominal capacity.

frequency/ duration	month	day	Time				
			hour				
			$5^{00}-6^{00}$	$6^{00}-8^{00}$	$8^{00}-11^{00}$	$11^{00}-22^{00}$	$22^{00}-5^{00}$
always in operation	January	Mo.-Fr. Saturday Sunday	42	78 68 55	52 40	45	33
	February	"	37	70 58 48	49 37	38	28
	March	"	33	52 45 38	43 33	30	29
	April	"	27	35 31 25	32 25	20	20
	May	"	35	40	35	25	25
	June	"	-	-	-	-	-
	July	"	-	-	-	-	-
	August	"	-	-	-	-	-
	September	"	37	52	37	22	22
	October	"	23	35 30 25	28 20	20	20
	November	"	33	58 48 40	40 30	30	23
	December	"	37	72 58 48	43 33	38	25

Emissions Inventory Data for Trade and Minor Industry

A

of The Land Institution for Environmental Control
of North Rhine-Westphalia

Questionnaire Form A: General Data

1. Operator data

Firm, name: Hans Müller

Postal address: Hansa-Platz, 5, 5000, Köln
(Street, No., Postal code, City)

County:

Tel.-No.: 0221/681795
(with dialling code)

Person to contact regarding this report:

at the operator (Tel.-No. as before): Mr. H. Müller

by the authority

in Köln Mr. H. Schmitz

2. General plant data

2.1 Nature of the plant*) Filling-Station

2.2 Location of the plant:

City: Köln

Street, No. Hansa-Platz, 5 County: NW

2.3 Geographical Location**) and height above sea level:

x coordinate							y coordinate						
km				m			km				m		
2	5	6	3	3	8	0	5	6	2	3	7	8	0

geod. height		
m		
0	5	2

*) General name of the plant, for which the data are collected by the following questionnaire forms (T, [illegible])

**) The geographical location of the plant is to be declared by the center point coordinates (x/y) of the plant.

working place-No.***)						

***) Code which allows to identify the branches of industry, minor industry, trade etc.

Fig. 2: Completed questionnaire form for the general data

Emissions Inventory Data for Trade and Minor Industry

T

of The Land Institution for Environmental Control
of North Rhine-Westphalia

Questionnaire Form T: Filling station

date of issue 28. Januar 1978 (date) by Hansmann (name)

1. Fuel sale

gasoline (high octane)	700	m^3/yr.
gasoline (normal)	1000	m^3/yr.
gas oil	100	m^3/yr.
total	1800	m^3/yr.

2. Fuel delivery

(frequency per year and mass of filling)

gasoline (high octane)	for	70	times per year	10000	liter
gasoline (normal)	for	100	times per year	10000	liter
gas oil	for	10	times per year	10000	liter

3. Outlet of the gases in connection with fuel delivery by tank-car

Shuttle gas line: yes ☐ no ☒

Exit height of the outlet*) above ground 5 m

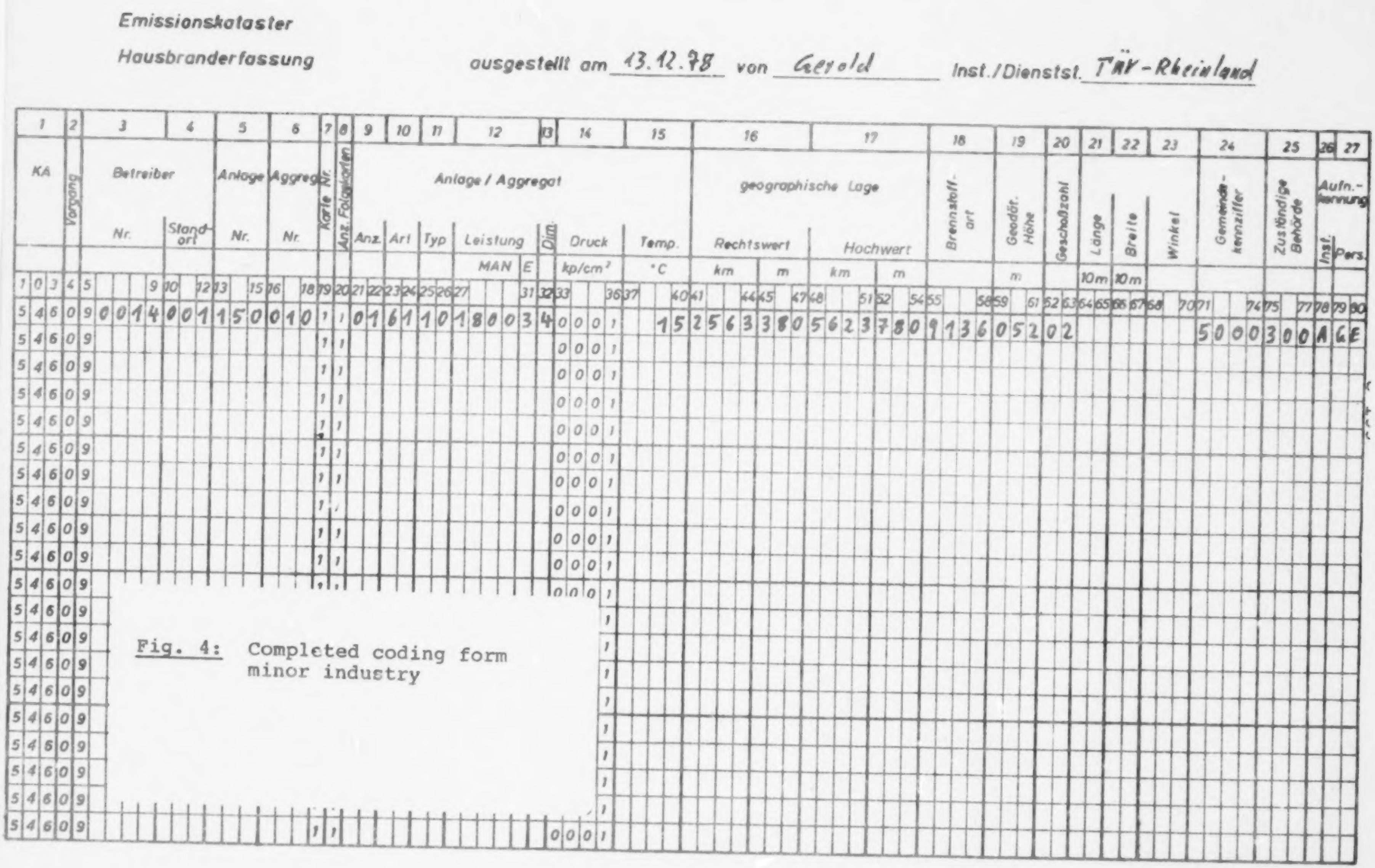
4. Opening time

Monday to Friday	from	0.00	hr to	24.00	hr
Saturday	from	0.00	hr to	24.00	hr
Sunday	from	0.00	hr to	24.00	hr

*) Outlet of the gases with shuttle gas line may end at gasoline pump.

working place-No.

Fig. 3: Completed questionnaire form T



Emissionskataster

Hausbranderfassung

ausgestellt am 13.12.78 von Gerold Inst./Dienstst. TÜV-Rheinland

1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20	21	22	23	24	25	26	27
KA	Vorgang	Betreiber		Anlage	Aggregat	Karte Nr.	Anz. Folgekarten	Anlage / Aggregat								geographische Lage				Brennstoff-art	Geodät. Höhe	Geschoßzahl	Länge	Breite	Winkel	Gemeinde-kennziffer	Zuständige Behörde	Aufn.-kennung	
		Nr.	Standort	Nr.	Nr.			Anz.	Art	Typ	Leistung		Dim.	Druck	Temp.	Rechtswert		Hochwert										Inst.	Pers.
											MAN	E		kp/cm²	°C	km	m	km	m		m		10m	10m					
1 0 3	4	5 9	10 12	13 15	16 18	19	20	21 22	23 24	25 26	27	31	32	33 36	37 40	41 44	45 47	48 51	52 54	55 58	59 61	62 63	64 65	66 67	68 70	71 74	75 77	78	79 80
546	0	90014	001	150	010	1	1	01	61	10	1800	3	4	0001	15	2563	380	5623	780	9136	052	02				5000	300	A	GE
546	0	9				1	1							0001															
546	0	9				1	1							0001															
546	0	9				1	1							0001															
546	0	9				1	1							0001															
546	0	9				1	1							0001															
546	0	9				1	1							0001															
546	0	9				1	1							0001															
546	0	9				1	1							0001															
546	0	9				1	1							0001															
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546	0	9												1															
546	0	9												1															
546	0	9				1	1							0001															

Fig. 4: Completed coding form minor industry

Filling stations emit substances when fuels are transferred

- into storage tanks and
- into the motor vehicle tanks

Emissions are calculated via emission factors and the fuel turn-over. These two data are sufficient to make an emission estimate. A better resolution can be gained by using 4 plant standards with different fuel turn-overs:

- fuel stations with less than 500 m³
- fuel stations with 501 - 1000 m³
- fuel stations with 1001 - 2000 m³ and
- fuel stations with more than 2000 m³

The following example shows the development of a fuel station standard with a turn-over of 1001 - 2000 m³: The average turn-over is 1500 m³ consisting of 38 % of gasoline (high octane), 59 % gasoline (normal) and 3 % of gas oil. Two different kinds of emissions have to be distinguished for these fuels:

- emissions from transfers into storage tanks
- emissions from transfers into the car tanks

In both cases only the volumes displaced are taken into account. This procedure is acceptable as the storage tanks are situated below the ground surface and tank breathing due to solar radiation can be neglected.

The calculation of emissions from tanks is done via the volume displaced and the concentration of saturation. As the latter is highly dependent on temperature different calculations are made for the transfer of gasoline and gas oil into the car tanks in summer (May to September) and in winter (October to April). Due to the underground storage this can be neglected when calculating the emissions during the transfer into the storage tanks.

Transfer into storage tanks

The turnover is distributed corresponding to the average size (10000/5000 Liters) of the fuel wagons. A product temperature in the underground tanks is at 15 °C.

Transfer into car tanks

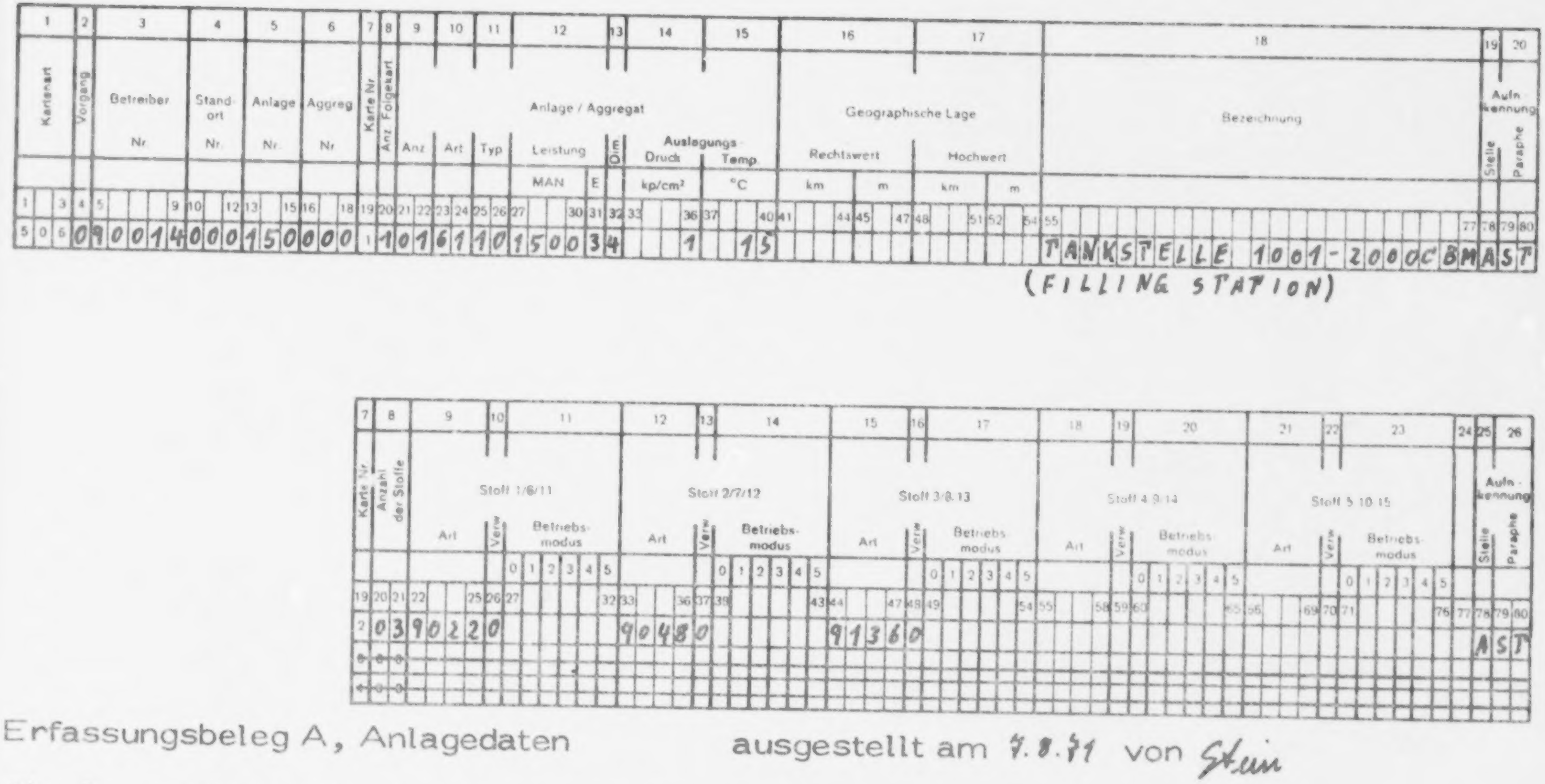
The average amount per motor vehicle is estimated to be 30 l. The turnover is distributed corresponding to the opening hours of the fuel station. The product temperature in the car tanks is at 30 °C in sommer and 20 °C in winter.

The resulting emissions for the transfer into the storage tanks and into the car tanks and their emission times are summarized in Table 6. The corresponding coding forms are given in Figs. 5 and 6.

In some of the German Länder the plants are registered individually using the questionnaire form "minor industry". This corresponds to an individual approach including an emission calculation and a time sharing as was mentioned for the plant standards. This means that emission data must be collected individually for each plant. By this the time resolution of the emissions of each plant can be collected in accordance with the real situation (refer to questionnaire form T in Fig. 3). This is valid especially for the mass flow of emissions due to the real turnover of gasoline and gas oil. In the cases of the plant standards the ratio of the substances is always equal. Furthermore the spatial resolution of the sources - breathing pipe of the storage tank and the pipes of the car tanks - can be described in detail in contrast to a plant standard.

Table 6: Data relating to the emissions process for the plant standard filling station, turn-over 1001 - 2000 m^3/hr (figures in brackets correspond to code-Nos.)

operational process	substance		exhaust blast m^3/hr	emissions mass flow mg/hr	time				
	name	mass flow liters/supply			frequency	duration mins.	month	day	hour
transfer into the storage tanks	gasoline, high octane (9136)	10,000	40	$45x10^6$	57 per year (57/6)	15 (15/2)	Jan.-Dez. (AL)	Mo.-Fr. (AF)	0.00-24.00 (AX)
	gasoline, normal (9048)	10,000	40	$45x10^6$	88 per year (88/6)	15 (15/2)	Jan.-Dez. (AL)	Mo.-Fr. (AF)	0.00-24.00 (AX)
	gas oil (9022)	5,000	30	$38,2x10^3$	9 per year (9/6)	10 (10/2)	Jan.-Dez. (AL)	Mo.-Fr. (AF)	0.00-24.00 (AX)
transfer into the car tanks	gasoline, high octane (9136)	30	1,8	$2358x10^3$	57 per day (57/4)	1 (1/2)	Oct.-Apr. (JD)	Mo.-So. (AG)	0.00-24.00 (AX)
				$3600x10^3$	57 per day (57/4)	1 (1/2)	May-Sept. (JD)	Mo.-So. (AG)	0.00-24.00 (AX)
	gasoline, normal (9048)	30	1,8	$2358x10^3$	87 per day (87/4)	1 (1/2)	Oct.-Apr. (JD)	Mo.-So. (AG)	0.00-24.00 (AX)
				$3600x10^3$	87 per day (87/4)	1 (1/2)	May-Sept. (EI)	Mo.-So. (AG)	0.00-24.00 (AX)
	gas oil (9022)	30	1,8	2700	5 per day (5/4)	1 (1/2)	Oct.-Apr. (JD)	Mo.-So. (AG)	0.00-24.00 (AX)
				6840	5 per day (5/4)	1 (1/2)	May-Sept. (EI)	Mo.-So. (AG)	0.00-24.00 (AX)



1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		17		18	19	20
Kartenart	Vorgang	Betreiber Nr.	Standort Nr.	Anlage Nr.	Aggreg Nr.	Karte Nr.	Anz. Folgekart	Anlage / Aggregat								Geographische Lage				Bezeichnung	Aufn.-kennung	
								Anz	Art	Typ	Leistung		E / Dim	Auslegungs- Druck	Auslegungs- Temp.	Rechtswert		Hochwert			Stelle	Paraphe
											MAN	E		kp/cm²	°C	km	m	km	m			
1–3	4	5–9	10–12	13–15	16–18	19	20	21–22	23–24	25–26	27–30	31	32	33–36	37–40	41–44	45–47	48–51	52–54	55–77	78	79–80
506	0	90014	000	150	000	1	1	01	61	10	1500	3	4	1	15					TANKSTELLE 1001-2000CBM	A	ST

(FILLING STATION)

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Karte Nr.	Anzahl der Stoffe	Stoff 1/6/11			Stoff 2/7/12			Stoff 3/8/13			Stoff 4/9/14			Stoff 5/10/15				Aufn.-kennung	
		Art	Verw	Betriebsmodus 0 1 2 3 4 5	Art	Verw	Betriebsmodus 0 1 2 3 4 5	Art	Verw	Betriebsmodus 0 1 2 3 4 5	Art	Verw	Betriebsmodus 0 1 2 3 4 5	Art	Verw	Betriebsmodus 0 1 2 3 4 5		Stelle	Paraphe
19	20–21	22–25	26	27–32	33–36	37	38–43	44–47	48	49–54	55–58	59	60–65	66–69	70	71–76	77	78	79–80
2	03	9022	0		9048	0		9136	0									A	ST
3	00																		
4	00																		

Erfassungsbeleg A, Anlagedaten ausgestellt am 7.8.71 von Stein

Fig. 5: Completed coding form "Plant Data" for the plant standard of the fillig station with an average turnover of 1500 m³

1	2	3	4	5	6	7	8	9	10	11		12	13	14		15	16	17	18	19	20	21	22		23		24		25	26	27	28	29	30	31	32	33	34
Kartenart	Vorgang	Betreiber	Standort	Anlage	Aggregat	Quelle	Leistung in % d Nennleist	Emittierter Stoff					Abgas					Emissionsmodus	Betriebsmodus	Erw Betriebsmod	Häufigkeit	Zeitdauer	Zeitangabe						Gasreinigungsanlage			Ermittlung		Aufn kenng		Sonderprogramm	Satz Nr	
		Nr	Nr	Nr	Nr	Nr		Art	P	Massenstrom		S	Art	Volumenstrom		S	Temp						Monat		Tag		Stunde		Nr	Typ	Leistung	Art	Jahr	Stelle	Paraphe			
							%			MAN	E	%		MAN	E	%	°C				D	D	A	E	A	E	A	E			% 1/18							
1 3	4	5 9	10 12	13 15	16 18	19 21	22 23	24 27	28	29 32	33	34 35	36	37 40	41	42 43	44 47	48 49	50	51	52 53 54	55 56 57	58	59	60	61	62	63	64	65 66	67 68 69	70	71 72	73	74 75	76	77 79	80
502	0	90014	000	150	000	001	0	9048	4	2358	3		0	1800	3		20	11	0	0	574	12	J	D	A	G	A	X				1	71	A	ST			
							0	9048	4	3600	3		0	1800	3		30	11	0	0	574	12	E	I	A	G	A	X										
							0	9048	4	45	6		0	40	6		15	10	0	0	576	152	A	L	A	F	A	X										
							0	9136	4	2358	3		0	1800	6		20	10	0	0	874	12	J	D	A	G	A	X										
							0	9136	4	3600	3		0	1800	6		30	11	0	0	874	12	E	I	A	G	A	X										
							0	9136	4	45	6		0	40	6		15	20	0	0	886	152	A	L	A	F	A	X										
							0	9022	4	2700	0		0	1800	3		20	11	0	0	54	12	J	D	A	G	A	X										
							0	9022	4	6840	0		0	1800	3		30	11	0	0	54	12	E	I	A	G	A	X										
							0	9022	4	382	2		0	30	6		15	30	0	6	96	102	A	L	A	F	A	X										

Erfassungsbeleg E, Emissionsdaten ausgestellt am 7.8.71 von Stein

Fig. 6: Emissions for the plant standard of the filling station with an average turnover of 1500 m³

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3. Example for street traffic

The determination of the emissions from car traffic can be described by three different groups of characteristic data:

- area related data	(sources)
- traffic related data	(traffic density)
- car related data	(emission factors)

The data of the third group correspond to the first step of the collective approach (ref. chapter 3.2.2). The emission factors published in a regulation (5th Regulation of the German Federal Immission Law 5. BImSchVwV) refer to the German car fleet and are valid for the whole Federal Republic of Germany (see Table 7). These data are at present updated.

The first and second groups of data correspond to the second stage of the collective approach (ref. chapter 3.2.2). The sources of the car traffic are subdivided into two types:

- line sources (street sections) and
- area sources (limited built-up parts of the heavy loaded areas)

The traffic related data are traffic density, i. e. the number of cars moving along the street sections and the driving modes. The basic data for establishing the emissions inventory "car traffic" are therefore number and size of sources of the corresponding source type as well as the numbers of cars moving and their speed.

Table 7: Emission factors for motor vehicles (mass-flow in gm per vehicle and hour)

A) motor cars with otto and diesel engine

emitted substances	average speed in km/hr													constant speed in km/hr
	1	5	10	15	20	25	30	35	40	45	50	55	60	100
CO	320	440	550	650	720	790	860	910	960	1000	1030	1070	1100	1440
SO_2 *)	0.52	0.84	1.14	1.36	1.54	1.68	1.82	1.96	2.08	2.20	2.32	2.42	2.54	4.82
NO_x (NO_2)	1.3	7.5	15.5	23.7	31.7	40.0	48.5	57.5	67.5	78.0	89.5	100	112	372
organic gases **)	34.0	46.0	56.5	65.5	72.5	77.5	82.5	86.5	90.0	92.0	94.0	95.5	96.5	119
dust (Pb)	0.11	0.15	0.21	0.26	0.30	0.33	0.36	0.39	0.42	0.44	0.46	0.48	0.50	0.94

B) trucks with diesel engine

emitted substances	average speed in km/hr						constant speed in km/hr
	10	20	30	40	50	60	85
CO	75	150	210	280	350	420	600
SO_2 *)	13	25	36	48	60	70	100
NO_x (NO_2)	35	70	100	140	170	200	280
organic gases **)	9	18	26	34	42	50	70
dust (soot)	5	9	13	17	21	25	36

*) sulfur content of gas oil 0,3 %

**) measurements with FID

Data collection and processing

The data collection and processing is in principle outlined for a street section as follows. The division into line and area sources can be seen from Fig. 7 giving the traffic density of the different sources within a heavy loaded area.

Line sources

Line sources are defined as such if streets have a high traffic density of about 100 cars/hr or more. Furthermore the traffic density and driving mode must be nearly constant in the area along the street or street section. The boundaries of such line sources are given by significant changes in these parameters due to strongly changing traffic situations.

The daily variations of the line sources are determined by traffic counts differentiating between private cars, station wagons and trucks. The counting is made between 6.00 and 20.00 hours on Tuesdays and Thursdays at the line sources. At about 20 to 30 % of the line sources the daily variation is determined also during the night hours and on Saturdays and Sundays. Thus, the expenses for the investigations can be limited. Therefore, the annual variation as well as differences between all days of the week are neglected. The data of times not investigated in detail are deduced empirically.

The results of traffic counts for an example (street section A in Fig. 7) are given in Fig. 8. The traffic densities are displayed graphically corresponding to the types of motor vehicles (ref. Fig. 9). The time

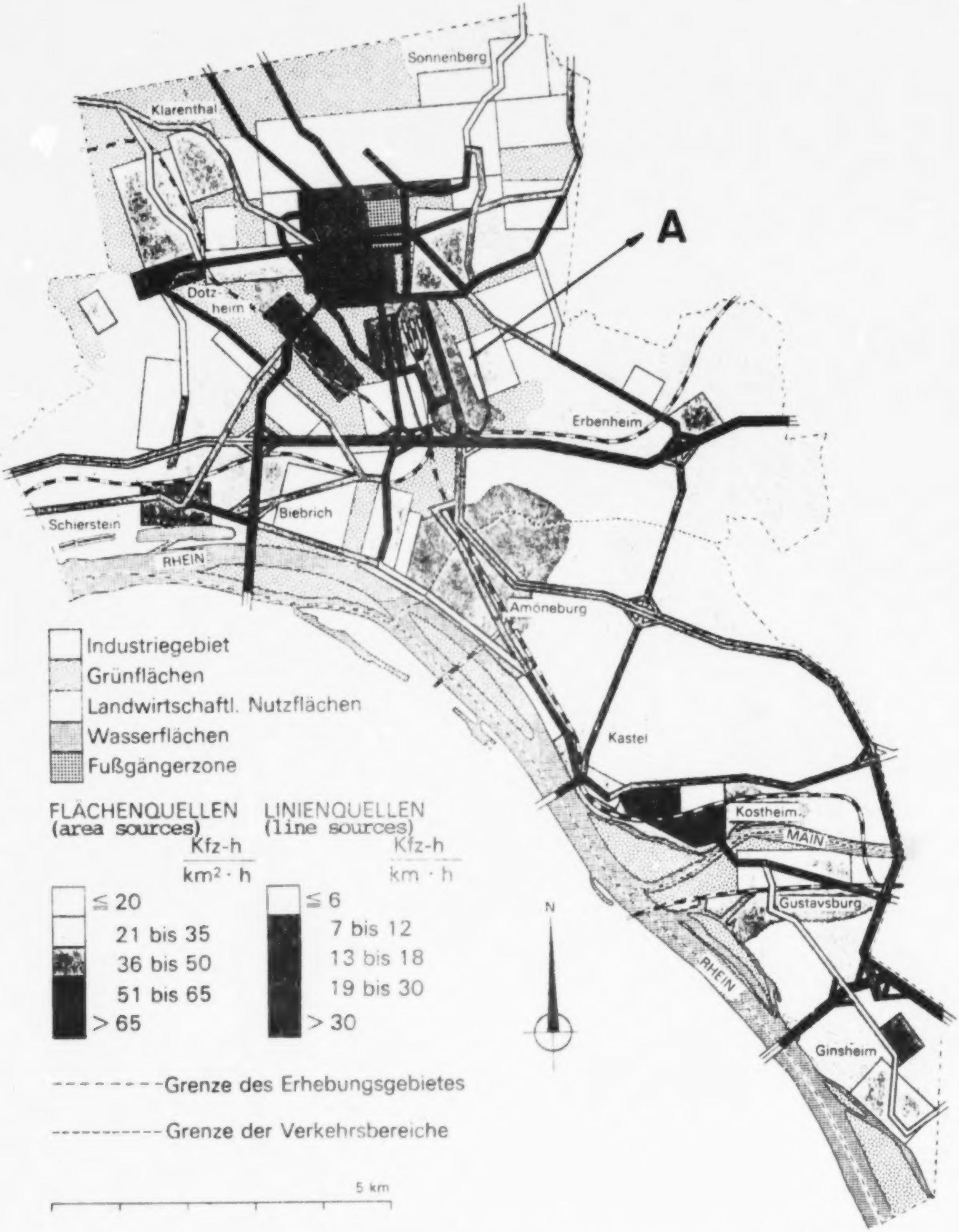

Bild 6.3: Spezifische Verkehrsdichte – Tagesmittelwert Montag–Freitag

Fig. 7: Example for dividing the sources of traffic in a heavy loaded area into line and area sources

Counting of traffic

City: Wiesbaden Date: 30.9.1975

No. of the counting place: 56 Day: Mo. [✓ Tu.] We. Th. Fr. Sa. Su.

Street: Mainzer Str.

from BAB to Ring

Place of counting:

Please count the traffic which drives in the following direction

---

Name: No.:

hour	motor cars	trucks	hour	motor cars	trucks
6.00 -6.15	150	40	13.00 -13.15	520	70
30	305	39	30	510	70
45	525	40	45	540	75
7.00	608	45	14.00	480	70
15	620	45	15	505	68
30	860	45	30	410	95
45	840	45	45	460	90
8.00	750	60	15.00	500	90
15	615	75	15	465	68
30	725	90	30	552	60
45	522	75	45	540	45
9.00	450	84	16.00	745	45
15	490	82	15	630	39
30	448	90	30	590	30
45	360	65	45	750	25
10.00	510	85	17.00	720	30
15	410	85	15	710	25
30	490	79	30	755	25
45	490	90	45	660	25
11.00	470	110	18.00	665	15
15	460	100	15	605	20
30	440	90	30	600	12
45	480	80	45	615	10
12.00	490	75	19.00	570	10
15	500	95	15	560	8
30	490	90	30	460	10
45	480	65	45	390	8
13.00	475	70	20.00	330	8

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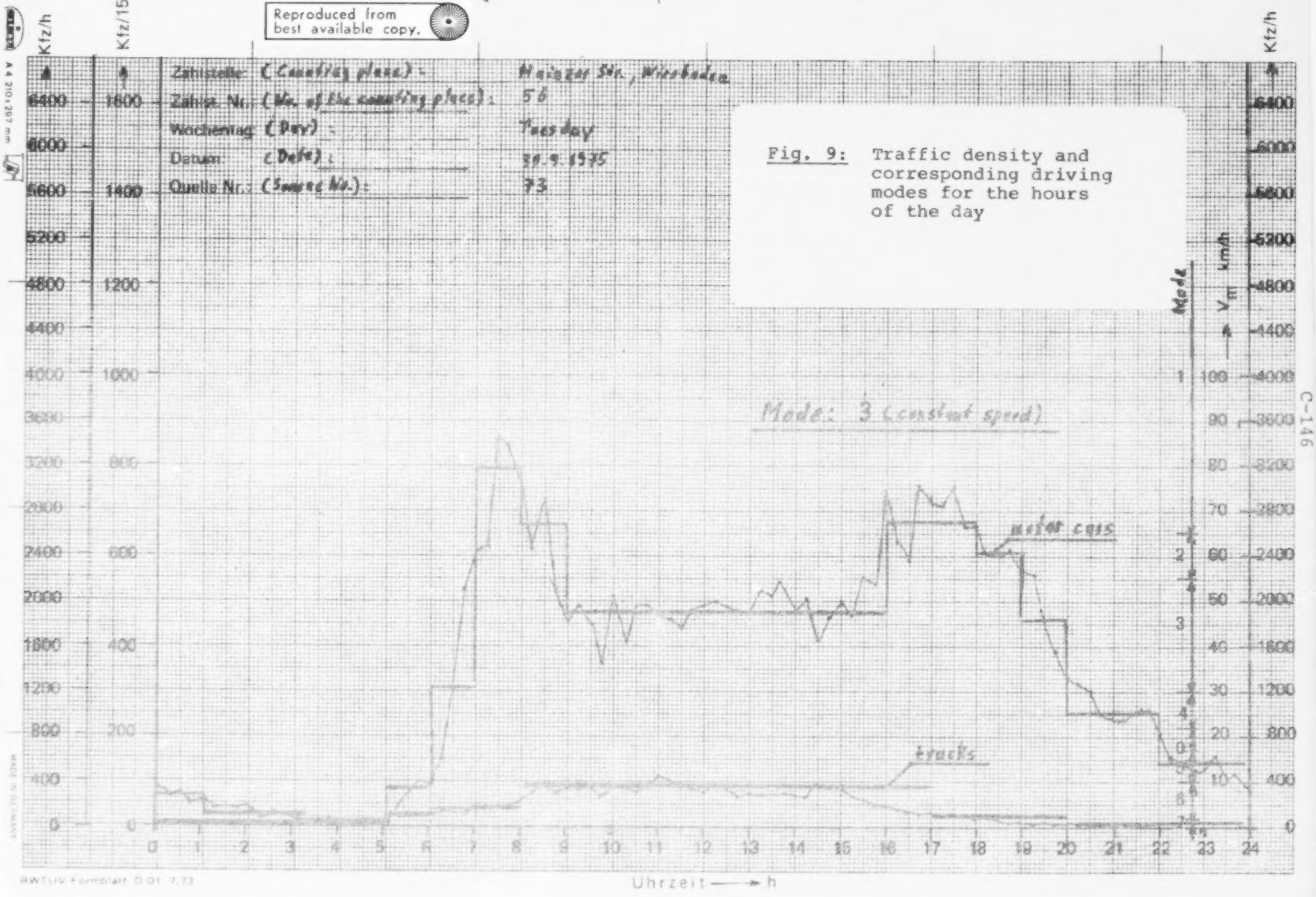

Zählstelle (Counting place): Mainzer Str., Wiesbaden

Zählst. Nr.: (No. of the counting place): 56

Wochentag (Day): Tuesday

Datum (Date): 30.9.1975

Quelle Nr.: (Source No.): 73

Fig. 9: Traffic density and corresponding driving modes for the hours of the day

dependence then is used to determine average values for one or several hours. The example of Fig. 9 refers to a working day (Tuesday). The corresponding driving modes are determined during the same period as the traffic counts. These driving modes are determined by a car running along with the traffic and allocated to an emission factor (ref. 1. stage of the collective approach). The corresponding data sheet is reproduced in Fig. 10.

Starting from the measuring data - driving duration (time in secs) and driving section (length in m) - the average speed is calculated and the driving mode allocated. The selected section corresponds in general to the length of the line source.

The following modes have proved to be sufficient to describe the traffic situations in German emissions inventories (ref. Table 8).

Table 8: Explanation of driving modes

driving mode	average driving speed in km/hr	characteristics
1	ca. 100	high ways
2	55 - 65	arterial roads
3	30 - 55	moving through traffic
4	22 - 30	moving traffic in town
0	17 - 22	comparative European test cycle
5	10 - 17	slow moving traffic in town
6	2 - 10	blocked roads

Fig. 10: Measurement of the average speed for the traffic in street sections

City: Wiesbaden

Date: 16.9.75

street section	beginning of the measurement	time of driving	length of street section	average speed	
Mainzer Str.	time	sec	m	km/h	mod.
Abschnitt: BAB-Ring	5,36	137	2130	56	2
	5,59	135	"	57	2
	6,43	144	"	53	3
	7,02	154	"	50	3
	7,06	169	"	45	3
	7,30	192	"	40	3
	7,45	148	"	52	3
	8,07	183	"	42	3
	8,26	176	"	44	3
	8,47	220	"	35	3
	10,23	179	"	43	3
	10,45	226	"	34	3
	11,49	172	"	45	3
	12,11	191	"	40	1
	12,23	158	"	49	3
	12,43	162	"	47	3

Fig. 10: Completed coding form, determination for the average speed and driving mode

The driving modes (Fig. 10) are allocated in respect of time to the traffic densities and displayed in diagrams as given in Fig. 9. The driving modes are valid for private cars, station wagons and trucks. If different driving modes are observed during the shortest measuring time of one hour the driving mode with the lowest average speed is to be considered in the investigation.

The resulting data of traffic density and driving mode for the different hours of the day then are transferred into the corresponding data form "car traffic". These data as well as the source data are displayed in Figs. 11 - 13. The corresponding data print-out for trucks (type of motor vehicle "2") is shown in Fig. 14. The print-out is identical with the emission data print-out of the individual approach for plant standards. However, the number of cars per hour of the line sources is indicated and not the emitted mass flow.

The substance code numbers characterize the driving mode and the type of motor vehicle and not the substance emitted. The "substance number" 9063 therefore indicates truck emissions for driving mode number "3".

The code numbers of source type and type of motor vehicle are taken from catalogues. "Operator and Site Nos." are provided by a central organization and allocated to the operator data file. The substances used are given in Table 7.

Area_Sources

The handling of area sources is in principle equal to that of line sources. A criterion for estimating the traffic density is the density of the built-up areas being assorted as follows:

EMISSIONSKATASTER STRASSENVERKEHR

Bezirk: Wiesbaden
Strasse: Mainzer Str.
Abschnitt:

1	2	3	4	5	6	7	8	9	10	11		12		13	14	15	16
KA	Betreiber Nr.	Stand-ort Nr.	Quelle Nr.	Länge der Quelle m	Fahrzeugart	Fahrmodus	Zeile Nr.	Anzahl	S %	Zeitangabe Tag von	bis	Uhrzeit von	bis	Nachweis Art	Jahr	Institut	Paraphe
1 2 3	4 5 6 7 8	9 10 11	12 13 14	15 16 17 18	19	20	21	22 23 24 25	26 27	28	29	30 31	32 33	34	35 36	37	38 39
512	62101	001	73	245	1	3		900	40	7	7	09	11	2	75	A	WE
								1190	40			11	14	2			
								1940	50			14	16	2			
								1800	30			16	18	2			
								1720	30			18	19	2			
								1200	40			19	21	2			
								840	50			21	22	0			
								260	50			22	23	0			
								120	50	6	6	00	01	0			
								40	50			01	06	0			
								220	50			06	07	0			
								400	40			07	08	2			
								920	40			08	09	2			
								1220	40			09	10	2			
								1540	30			10	15	2			
								1200	40			15	20	2			
								900	40			20	21	2			
								430	50			21	22	0			
								180	50			22	24	0			
					2	3		5	50			21	06	0			
								150	40			07	08	2			
								70	50			06	07	0			
								200	30			08	15	2			
								110	30			15	17	2			
								50	30			17	21	2			

Fig. 11: Completed coding form STREET TRAFFIC

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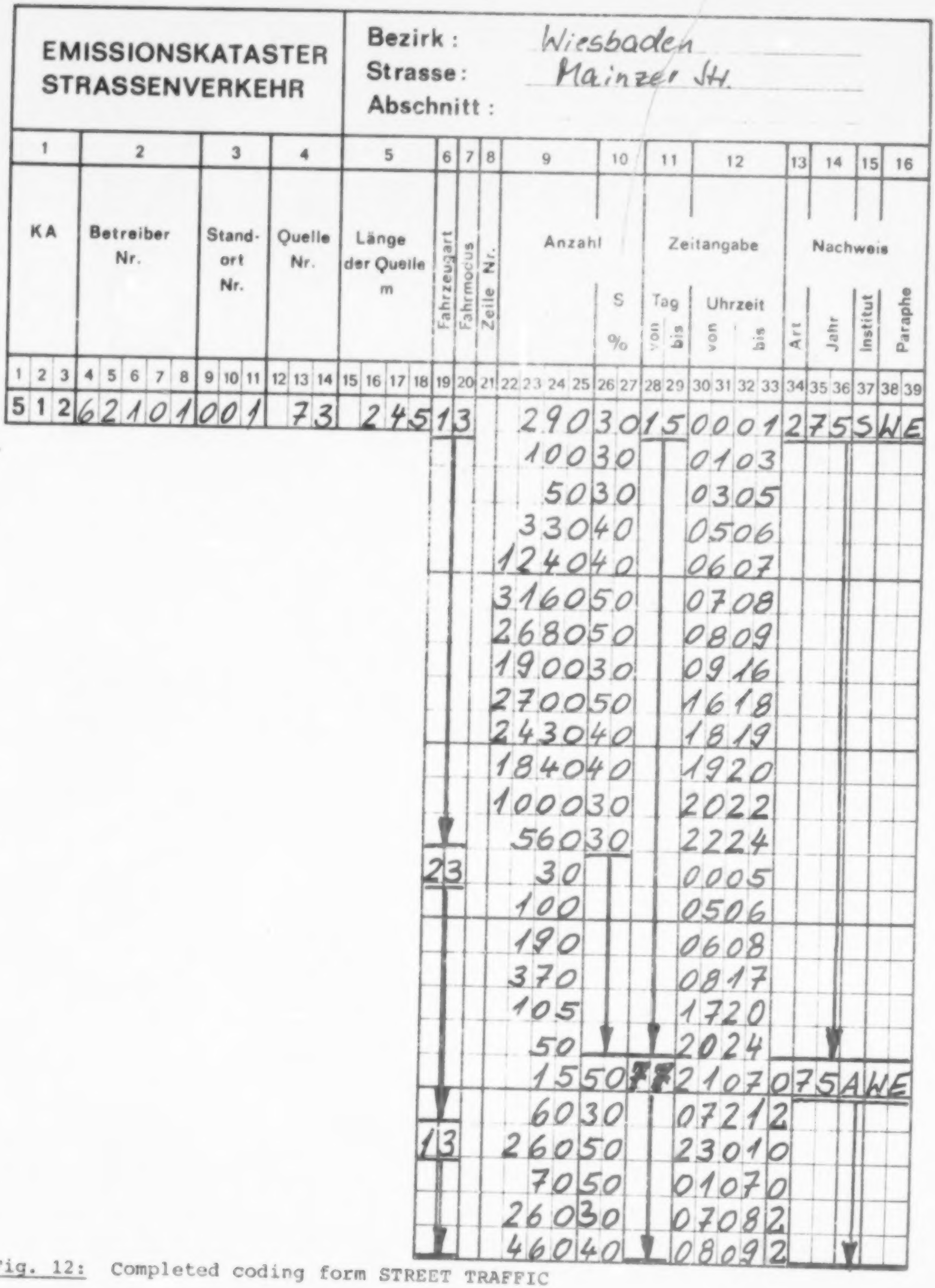
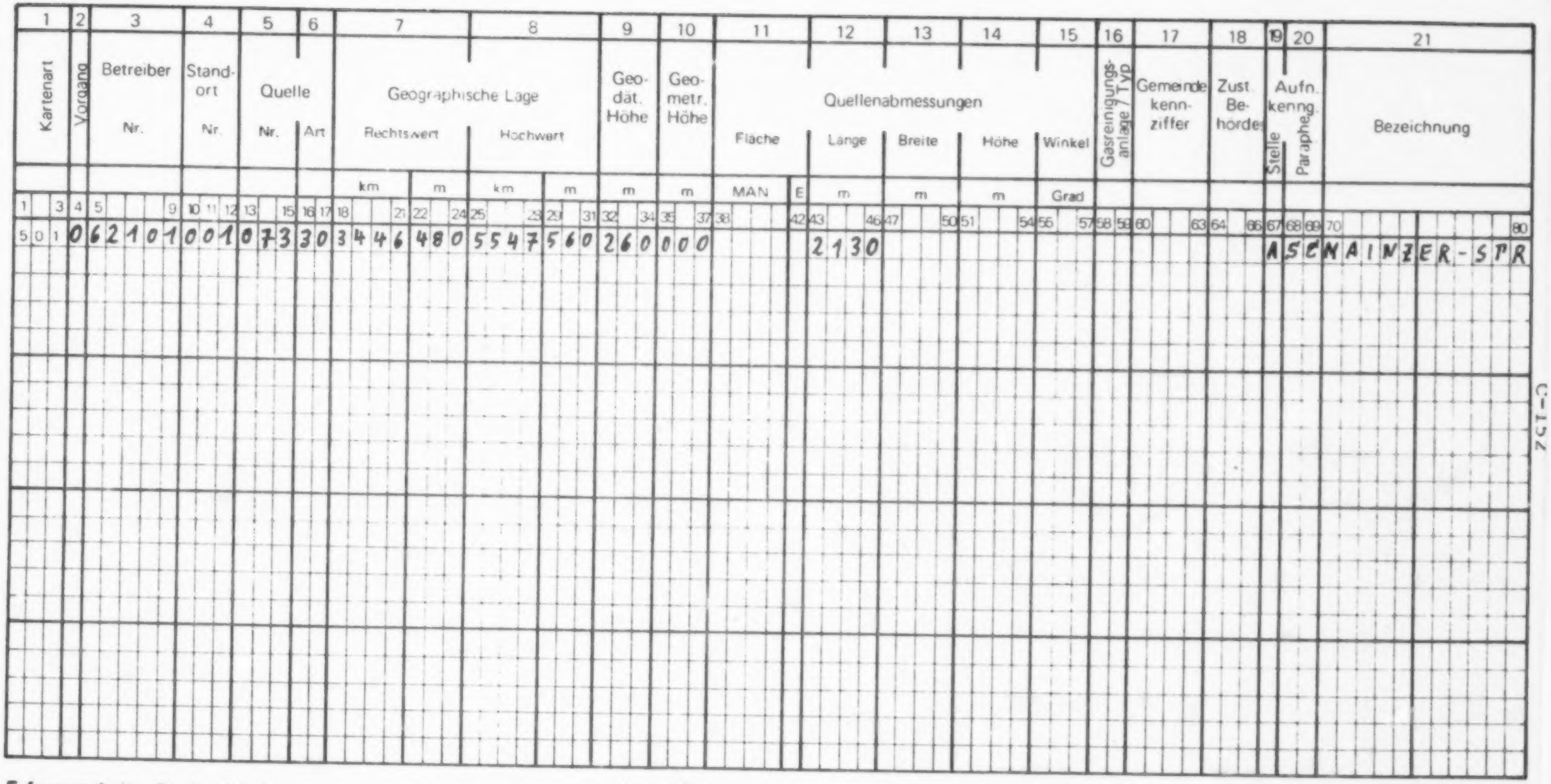


EMISSIONSKATASTER STRASSENVERKEHR

Bezirk : Wiesbaden
Strasse : Mainzer Str.
Abschnitt :

1	2	3	4	5	6	7	8	9	10	11		12		13	14	15	16
KA	Betreiber Nr.	Standort Nr.	Quelle Nr.	Länge der Quelle m	Fahrzeugart	Fahrmocus	Zeile Nr.	Anzahl	S %	Zeitangabe Tag von	bis	Uhrzeit von	bis	Nachweis Art	Jahr	Institut	Paraphe
1 2 3	4 5 6 7 8	9 10 11	12 13 14	15 16 17 18	19	20	21	22 23 24 25	26 27	28	29	30 31	32 33	34	35 36	37	38 39
512	62101	001	73	245	1	3		290	30	1	5	00	01	2	75	S	WE
								100	30			01	03				
								50	30			03	05				
								330	40			05	06				
								1240	40			06	07				
								3160	50			07	08				
								2680	50			08	09				
								1900	30			09	16				
								2700	50			16	18				
								2430	40			18	19				
								1840	40			19	20				
								1000	30			20	22				
								560	30			22	24				
					2	3		30				00	05				
								100				05	06				
								190				06	08				
								370				08	17				
								105				17	20				
								50				20	24				
								15	50	7	7	21	07	0	75	A	WE
								60	30			07	21	2			
					1	3		260	50			23	01	0			
								70	50			01	07	0			
								260	30			07	08	2			
								460	40			08	09	2			

Fig. 12: Completed coding form STREET TRAFFIC



1	2	3	4	5	6	7		8		9	10	11		12	13	14	15	16	17	18	19	20	21
Kartenart	Vorgang	Betreiber	Standort	Quelle		Geographische Lage				Geodät. Höhe	Geometr. Höhe	Quellenabmessungen						Gasreinigungsanlage / Typ	Gemeindekennziffer	Zust. Behörde	Aufn. kenng.		Bezeichnung
		Nr.	Nr.	Nr.	Art	Rechtswert		Hochwert				Fläche		Länge	Breite	Höhe	Winkel				Stelle	Paraphe	
						km	m	km	m	m	m	MAN	E	m	m	m	Grad						
1 3	4	5 9	10 11 12	13 15	16 17	18 21	22 24	25 28	29 31	32 34	35 37	38	42	43 46	47 50	51 54	55 57	58 59	60 63	64 66	67	68 69	70 80
501	0	62101	001	073	30	3446	480	5547	560	260	000			2130							A	SC	MAINZER-STR

Erfassungsbeleg Q, Quellendaten ausgestellt am 11.11.75 von Schneider

Fig. 13: Completed coding form for the source data file

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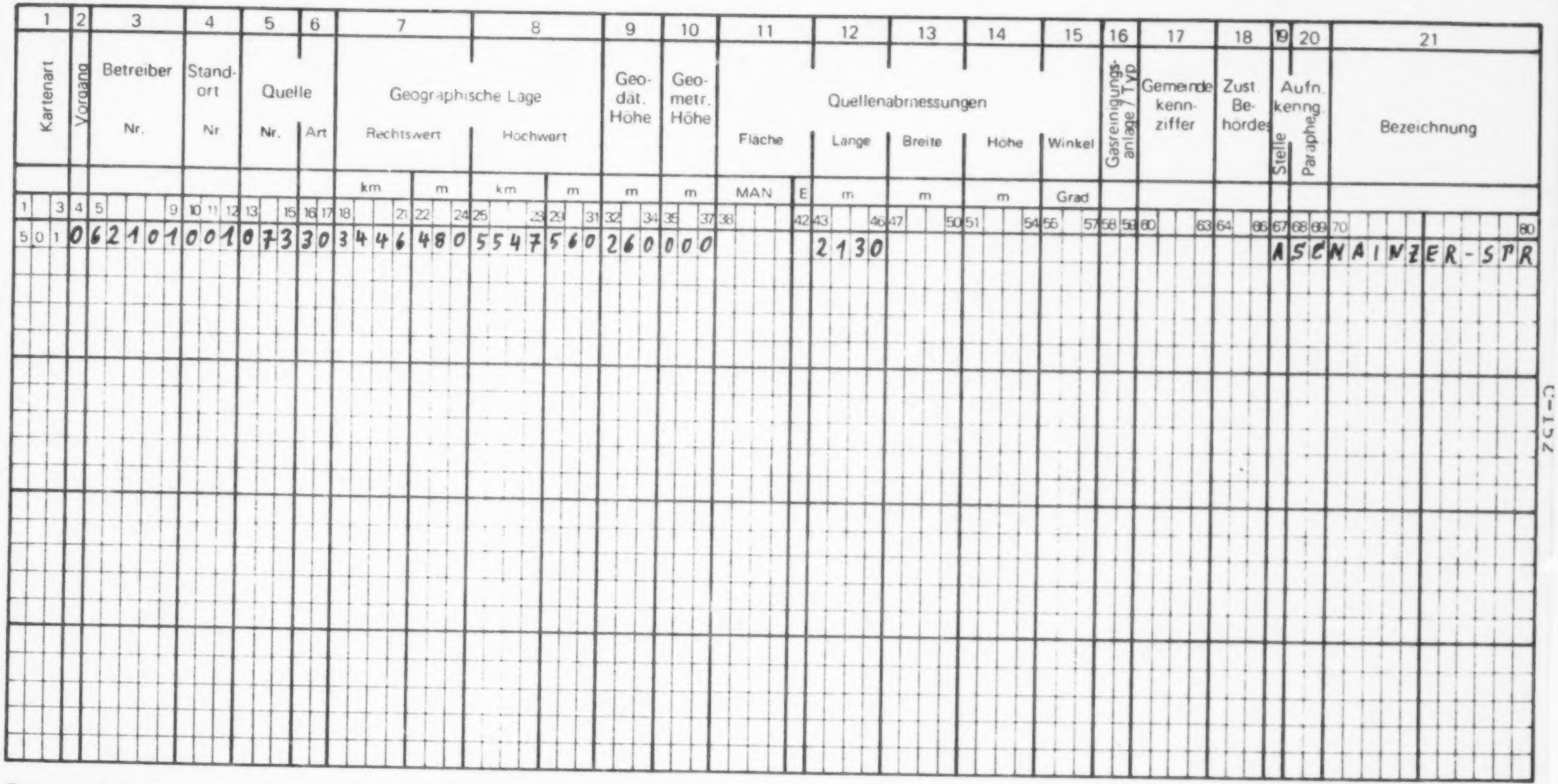

1	2	3	4	5	6	7		8		9	10	11		12	13	14	15	16	17	18	19	20	21
Kartenart	Vorgang	Betreiber Nr.	Standort Nr.	Quelle Nr.	Art	Geographische Lage Rechtswert		Hochwert		Geodät. Höhe	Geometr. Höhe	Quellenabmessungen Fläche		Länge	Breite	Höhe	Winkel	Gasreinigungsanlage / Typ	Gemeindekennziffer	Zust. Behörde	Aufn. kenng. Stelle	Paraphe	Bezeichnung
						km	m	km	m	m	m	MAN	E	m	m	m	Grad						
1 3	4	5 9	10 11 12	13 15	16 17	18 21	22 24	25 28	29 31	32 34	35 37	38	42	43 46	47 50	51 54	55 57	58 59	60 63	64 66	67	68 69	70 80
501	0	62101	001	073	30	3446	480	5547	560	260	000			2130							A	SC	NAINZER-SPR

Erfassungsbeleg Q, Quellendaten ausgestellt am 11.11.75 von Schneider

Fig. 13: Completed coding form for the source data file

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     GESAMTREPORT DER EMISSIONSDATEI   -   T2040113                                                            14. 1.76   BLATT    52

BETRIEBN ANLAGG QUE LE  EMITTIERTER STOFF    A B G A S   ABGAS  KCD HAEU ZEIT ZEITAN GASR-ANL ERM AUF S LFD EMISSIONS      JAHRES
     STA                 ART P   MENGE  SA  A   MENGE  S   TEMP      FIGK      NOTAST        LST     KEN O      WAHRSCH-    AUSWURF
  NR ORT   NR     NR  %   NR      (G/H)  %      (L/H)   %  GRAD       ZAH  ZAD ALAEAE NRTY   %  A J I P P  NR  LICHKEIT      (KG)

62101001   2000   73   0 9063 4 .4370+03 50  0 .4370+03 50    90 3000    0    0 ALFFGG    0    0 075 AWE 3   1 .59524-02  .21014+02
62101001   2000   73   0 9063 4 .2979+02 50  0 .2979+02 50    90 3000    0    0 ALFFVF    0    0 075 AWE 3   2 .53571-01  .13511+02
62101001   2000   73   0 9063 4 .8636+03 40  0 .8636+03 40    90 3000    0    0 ALFFFH    0    0 275 AWE 3   3 .59524-02  .45031+02
63101001   2000   73   0 9063 4 .6333+03 30  0 .6333+03 30    90 3000    0    0 ALFFPQ    0    0 275 AWE 3   4 .11905-01  .66044+02
62101001   2000   73   0 9063 4 .1152+04 30  0 .1152+04 30    90 3000    0    0 ALFFIO    0    0 275 AWE 3   5 .41667-01  .42048+03
62101001   2000   73   0 9063 4 .2979+03 30  0 .2979+03 30    90 3000    0    0 ALFFPU    0    0 275 AWE 3   6 .23810-01  .60048+02
62101001   2000   73   0 9063 4 .1727+03 30  0 .1727+03 30    90 3000    0    0 ALAEAE    0    0 275 SWE 3   7 .14881+00  .22513+03
62101001   2000   73   0 9063 4 .5758+03 30  0 .5758+03 30    90 3000    0    0 ALAEFF    0    0 275 SWE 3   8 .29762-01  .15012+03
62101001   2000   73   0 9063 4 .2979+03 30  0 .2979+03 30    90 3000    0    0 ALAEUX    0    0 275 SWE 3   9 .11905+00  .30024+03
62101001   2000   73   0 9063 4 .6045+03 30  0 .6045+03 30    90 3000    0    0 ALAFRT    0    0 275 SWE 3  10 .69286-01  .47281+03
62101001   2000   73   0 9063 4 .1094+04 30  0 .1094+04 30    90 3000    0    0 ALAFGH    0    0 275 SWE 3  11 .59524-01  .57044+03
62101001   2000   73   0 9063 4 .2170+04 30  0 .2170+04 30    90 3000    0    0 ALASIG    0    0 275 SWE 3  12 .26786+00  .49979+04
62101001   2000   73   0 9063 4 .3455+03 30  0 .3455+03 30    90 3000    0    0 ALGGHU    0    0 275 AWE 3  13 .83333-01  .75221+03
62101001   2000   73   0 9063 4 .8636+02 50  0 .8636+02 50    90 3000    0    0 ALGGVG    0    0 075 AWE 3  14 .59524-01  .45031+02

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Fig. 14: Example for a printout of the emission data file for "traffic"

- built-up as in suburbs
- built-up as in city boundaries
- built-up as in cities

The streets not included as line sources are allocated to area sources for which the built-up status is defined by site inspections.

According to the structure of the built-up areas one or more area sources are selected for which the basic data are developed. The different kinds of streets, as one way road, high and low traffic streets are taken into account correspondingly. Following this an average time dependence is determined for every type of area source. The corresponding driving mode is determined from a representative street section within the area source as is done for the line sources.

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ANNEX I

Names and Addresses of Panel Members (as of Fall 1978)

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ANNEX II

NATO/CCMS Documents on the First Air Pollution Pilot Study (available at: NATO/Committee on the Challenges of Modern Society, NATO Headquarters, Brussels, Belgium)

AIR POLLUTION (No. 5)

Proceedings of the 2nd Meeting of the Expert Panel on Air Pollution Modeling, (26 - 27 July 1971, Paris, France). Out of stock

AIR POLLUTION (No. 6)

Guidelines to Assessment of Air Quality (Revised)

APPENDIX A	Assessment of Air Quality in Ankara (February 1973)
APPENDIX B	Assessment of Air Quality in St. Louis (February 1973)
APPENDIX C	Assessment of Air Quality in Frankfurt (June 1974)
APPENDIX D	Assessment of Air Quality in Oslo (February 1973)
APPENDIX E	Assessment of Air Quality in the South Holland Region (December 1973)

AIR POLLUTION (No. 7)

Quality Criteria for Sulphur Oxides
(November 1971). Out of stock

AIR POLLUTION (No. 8)

Air Quality Criteria for Particulate Matter
(November 1971). Out of stock

AIR POLLUTION (No. 10)

Air Quality Criteria for Carbon Monoxide (June 1972)

AIR POLLUTION (No. 12)

Control Techniques for Sulphur Oxide Air Pollutants
(October 1973)

AIR POLLUTION (No. 13)

Control Techniques for Particulate Air Pollutants
(October 1973)

AIR POLLUTION (No. 14)

Proceedings of the 3rd Meeting of the Expert Panel on Air Pollution Modeling
(2 - 3 October, 1972, Paris)

AIR POLLUTION (No. 15)

Air Quality Criteria for Nitrogen Oxides (June 1973)

AIR POLLUTION (No. 18)

Control Techniques for Carbon Monoxide Emissions from Stationary Sources (October 1973)

AIR POLLUTION (No. 19)

Control Techniques for Hydrocarbon and Organic Solvent Emissions from Stationary Sources (October 1973)

AIR POLLUTION (No. 20)

Control Techniques for Nitrogen Oxide Emissions from Stationary Sources (October 1973)

AIR POLLUTION (No. 29)

Air Quality Criteria for Photochemical Oxidants and Related Hydrocarbons (February 1974)

AIR POLLUTION (No. 30)

Proceedings of the 4th Meeting of the Expert Panel on Air Pollution Modeling, (28 - 30 May 1973, Oberursel, Germany)

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AIR POLLUTION (No. 33)

Final Report (May 1974)

AIR POLLUTION (No. 35)

Proceedings of the 5th Meeting of the Expert Panel on Air Pollution Modeling (4 - 6 June 1974, Roskilde, Denmark)

AIR POLLUTION (No. 41)

First Follow-up Report (December 1975)

AIR POLLUTION (No. 50)

Second Follow-up Report (December 1976)

AIR POLLUTION (No. 67)

Third Follow-up Report (November 1977)

AIR POLLUTION (No. 96)

Fourth Follow-up Report (October 1978)

AIR POLLUTION (No. 6, Appendix C revised)

Assessment of Air Quality in Frankfurt (December 1977)

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ANNEX III

NATO/CCMS Documents on the Pilot Study on Air Pollution Assessment Methodology and Modeling
(available at: NATO/Committee on the Challenges of Modern Society, NATO Headquarters, Brussels, Belgium)

Air Pollution (No. 42)

Proceedings of the 6th International Technical Meeting on Air Pollution Modeling and its Application
(24 - 26 September 1976, Frankfurt/Main, Germany)

Air Pollution (No. 51)

Proceedings of the 7th International Technical Meeting on Air Pollution Modeling and its Application
(7 - 10 September 1976, Airlie House, USA)

Air Pollution (No. 70)

Bibliography on Grey Literature on Air Quality Modeling, Part I (Applied Models) (October 1977)

Air Pollution (No. 71)

Air Quality Management Systems (AQMS) (October 1977)

Air Pollution (No. 88)

Bibliography on Grey Literature on Air Quality Modeling, Part II (New Modeling Techniques) (October 1978)

Air Pollution (No. 89)

Glossary of Terms Generally Used in Air Pollution Assessment Methodology and Modeling (October 1978)

Air Pollution (No. 80)

Proceedings of the 8th International Technical Meeting on Air Pollution Modeling and its Application
(20 - 23 September 1977, Louvain-la-Neuve, Belgium)

Air Pollution (No. 99)

Introduction to Air Quality Modeling (October 1978)

Air Pollution (No. 100)

Air Pollution Emissions Projecting (October 1978)

Air Pollution (No. 101)

Uses and Needs for Air Quality Modeling (May 1979)

Air Pollution (No. 102)

Fundamentals for the Application of a Gaussian Plume Model
(April 1979)

Air Pollution (No. 104)

Air Pollution Emissions Inventory Systems
(October 1978/July 1979)

APPENDIX A: Emissions Inventory in Belgium
APPENDIX B: Emissions Inventory in Canada
APPENDIX C: Emissions Inventory in Germany, Federal Republic of
APPENDIX D: Emissions Inventory in The Netherlands
APPENDIX E: Emissions Inventory in Norway
APPENDIX F: Emissions Inventory in the United States of America

Air Pollution (No. 106)

Practical Demonstration of Multiple Source Urban Air Quality Modeling (Gaussian Plume) (two parts, December 1978 and August 1980)

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Air Pollution (No. 71, Revised)

Air Quality Management Systems (AQMS) (April 1979)

Air Pollution (No. 105)

FINAL REPORT (October 1979)

Air Pollution (No. 103)

Proceedings of the 9th International Technical Meeting on Air Pollution Modeling and its Application
(28 - 31 August, 1978, Toronto, Canada)

Air Pollution (No. 108)

Proceedings of the 10th International Technical Meeting on Air Pollution Modeling and its Application
(23 - 26 October, 1979, Roma, Italy)